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Mercator's Map of the World, 1538. Facsimile in black-and-white, reproduced from the original in the Society's collection (only two original copies of this map are known). 1885.

THE
GEOGRAPHICAL REVIEW

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AËRONAUTICAL MAPS AND AËRIAL TRANSPORTATION

By HENRY WOODHOUSE
Editor of *Flying*

Maps have always been most important factors in military and naval operations, just as they have been important factors in peaceful travel over land and water. To the aviator the map is as important as to the navigator at sea; and just as the mariner's chart must tell the navigator of currents, depths of the water, and locations of rocks and reefs, so the aëronautical map must tell the aviator of the character of the land and the configuration of the bodies of water below. It must show the land as it is, the exact shape of cities, woods, and lakes; the course of rivers, railroads, and roads; it must indicate clearly the prominent landmarks and the established aërodromes and open fields suitable for landings, etc. In short, the aëronautical map must show the land as nearly as possible as it looks to the aviator from the air.

FOUR TYPES OF AËRONAUTICAL MAPS

The more important aëronautical maps in current use, especially in the present war, may be divided into four types. These, with the leading representatives of each type, are as follows:

(1) *General aëronautical maps.* These are maps that have already been in existence for some time but are on a scale suitable for aviation, say three or four miles to the inch. They are usually based on the larger-scale topographic sheets. Such a map is the Carte de France on the scale of 1:200,000 in 86 sheets published by the Service Géographique de l'Armée. On it roads are shown in red, railroads in black, forests and woods in green, and waterways in blue.

(2) *Special aëronautical maps.* These are maps that have been prepared primarily for aviation. They represent the usual map elements in a bold and striking way, stressing the features of importance to the aviator.

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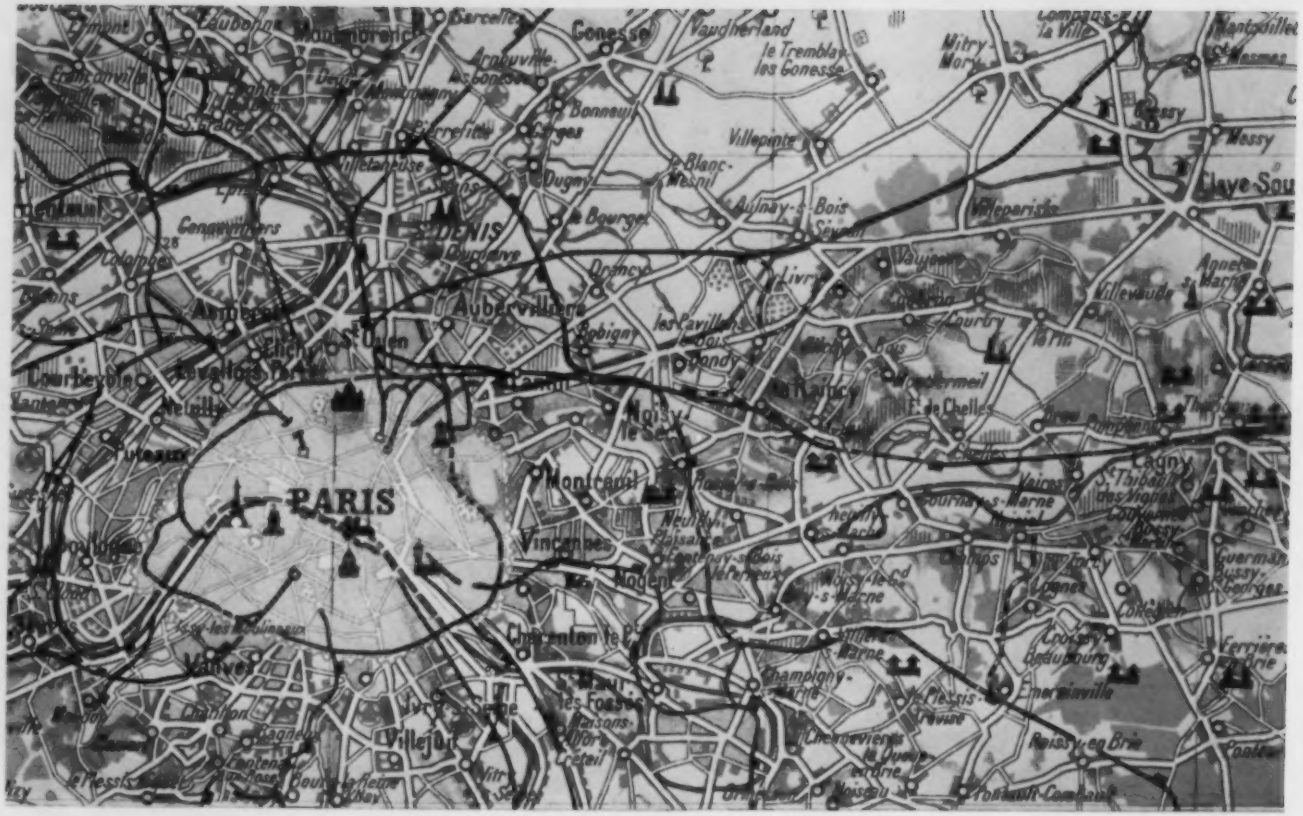
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Villemomble
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Mitry-Mory
Claye-Souilly
Messy
Villevaudé
Tremblay-les-Gonesse
Aulnay-s-Bois
Sevran
Vaujours
Le Blanc-Mesnil
Coubron
Le Pin
Chelles
Vaires
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Antony
Meudon
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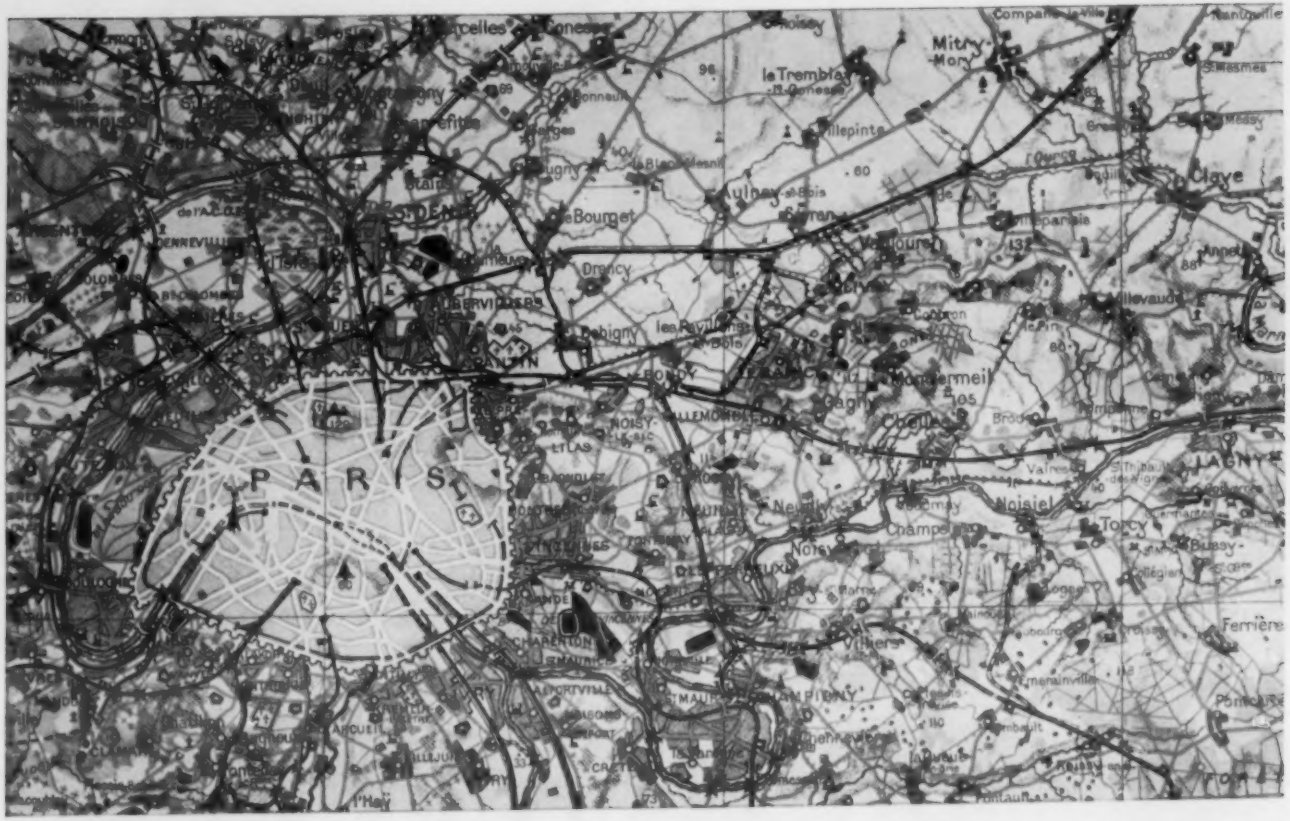


FIG. 2—A section of the Paris sheet of the aëronautical map of France, 1:200,000, published by the Aéro-Club de France. This section embraces exactly the same area, and on the same scale, as the figure above. The symbols are similar in type.

In addition they show aërodromes for aëroplanes and dirigibles; landing fields, when there are no hangars; stations where gas for dirigibles is obtainable; the approximate shape of cities, towns, and villages, and such landmarks as prominent churches, railroad stations, windmills, smokestacks, castles, and monuments. The two foremost maps of this type (see Figs. 1 and 2) are the Carte Aéronautique de la France[1] on the scale of 1:200,000 published by the Service Géographique de l'Armée since 1911 (at least four sheets issued before the war) and the Carte de France on the same scale published by the Aéro-Club de France since 1911 (at least thirteen sheets, covering the northeastern frontier, issued). A new and revised edition of this map is in course of publication.[2]

These maps are used for long-distance flights and raids. When a flight is planned, the aviators go over the map, lay down the route to be followed, and study the details given on the map, together with any other information that they may be able to get regarding the configuration of the land over which they will fly, the possible landing places, etc. Needless to add, the aviators make every effort to ascertain as closely as possible the nature of the enemy country in order to be sure to recognize places where bombs are to be dropped, as well as places where anti-aircraft guns are most likely to be waiting.

(3) *Special aëronautical maps for permanent aërial routes.* These give the information required by an aviator only for a strip of territory along a given route. This type of map originated in Italy and has not yet been put into general use outside of that country. The example reproduced herewith (Fig. 3) represents the first lap of an air route traversing the length of the Po Valley from Turin to Pordenone. The distinctive feature of this map is the treatment of the air route and its landing places. The route itself, a permanent one, is indicated as a red dotted line. The aërodromes are shown as red rings; the landing places which permit landing from two sides are shown as two red dots of the same size connected by a red line; the landing places which permit landing from one side only are indicated by two red dots of unequal size connected by a short line. The large dot represents the approximate place where the wheels of the aëroplane must touch on landing. The line that connects it with the smaller dot shows the direction toward which the aëroplane must run in landing. The distance between the first dot and the second is usually about 300 meters, and the width is usually about 100 meters.

This type of map greatly facilitates aërial navigation. An American map of this kind is the Sperry aëronautical map, which was described in the July, 1917, *Review*.[3] It was evolved independently of the Italian map

[1] Cf. P. Pollacchi: La Carte Aéronautique du Service Géographique de l'Armée, *Ann. de Géogr.*, Vol. 20, 1911, pp. 311-315.

[2] La "Carte-Avion": Nouvelle carte aéronautique de l'Aéro-Club de France, *l'Aérophile*, Feb. 1-15, 1917, pp. 68-69.

[3] O. B. Whitaker: Aëronautical Charts, *Geogr. Rev.*, Vol. 4, 1917, pp. 1-5; reference on pp. 2-4.

and has several improvements over the latter. In this series maps of the air routes between New York and Chicago, New York and Newport News, Va., and of Long Island, have already been prepared. In addition to the topographical information they carry, it is planned to show aërodromes (these are being established partly by the Army Air Service and partly by civil organizations); prominent landmarks; and the landing places for twenty-five to fifty miles on either side of the route. Each leg of the route is marked with its magnetic bearing, both coming and going, and compass roses showing the magnetic variation in a given district are added at frequent intervals. The bearing from one city to another is determined by projecting the line of flight between those two cities and then transferring this line by means of parallel rulers to the nearest compass rose. As all the bearings are magnetic, the pilot simply steers his craft according to the charted reading.

A map is also being prepared of the air-line, or great circle, route between New York and San Francisco, which would make it possible for any aviator to fly across the continent without losing his way. The Aero Club of America proposed to call this route the Woodrow Wilson Aërial Highway.

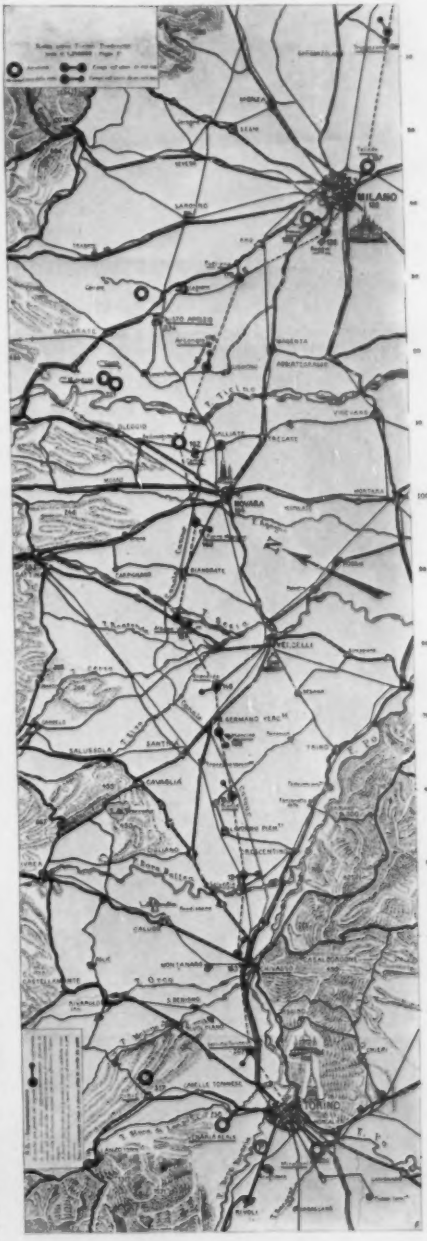


FIG. 3—Reduced photograph of the first sheet of an Italian air route map, 1:250,000, of the Po Valley from Turin to Pordenone. (Continued on the left.)

The air route is shown in a red dotted line (the line leading from Turin via Novara to Milan and beyond), aërodromes in red rings, and landing places by two dumbbell-shaped symbols with circles of equal or unequal size depending on whether the landing can be effected from two sides or from one side only.

FIG. 4—Outline map of the United States showing the route of the proposed Woodrow Wilson Aërial Highway and military camps and aviation stations. Scale, 1:26,000,000.

and, President Wilson having expressed his approval, work has been started to outline the route in detail and establish the landing places along the route. The map will not only show the narrow strip along its course, but will include lines leading from the main line to central landing places like Erie, Cleveland, and Detroit. The general course of the Wilson Highway is shown on Figure 4.

As soon as regular air lines are established to carry passengers and mail and aircraft start from a given station at a given time daily, it will be possible to insert on this type of map the approximate time at which the aircraft must pass certain places, so that the aviator will be able to navigate the air with even less trouble than the mariner navigates the sea. In fact, an aëroplane equipped with the Sperry automatic pilot could be set to follow the compass direction in trips of a few hundred miles, and thereafter the pilot would have practically nothing to do, as the automatic pilot would control his machine completely. The pilot would only have to guard against the drift due to side winds, which he would do by occasionally comparing his map with the ground below and setting his course right if necessary. Otherwise, finding out his whereabouts would be easy. Knowing the speed of his machine and the approximate time required to reach different places, he could determine by a glance at the watch at what point he should be at that hour.

(4) *Photographic maps.* It is on maps of this type that the military operations on the present battle fronts are based. In the conduct of these operations photographic maps are essential. They are re-made daily, often several times a day, to include the changes shown by the photographs taken by the aviators from their aëroplanes. These photographic maps show the configuration in the most minute details, and with the utmost care, as the success of certain operations depends upon the exactness of the smallest topographical details.

Aërial photography is now almost an exact science. The aviator from a height of 6,000 to 8,000 feet can take a photograph which will include and show clearly the whole of Manhattan Island; and the photograph can be enlarged to show the main streets, docks, bridges, and buildings. A series of photographs can be taken from New York to Albany which can be combined to form a continuous map of the entire route and show every detail to scale—such a map as could not be made by any other method even with the expenditure of years of time and large sums of money. Or the aviator, flying at what is considered a slow rate for an aëroplane, about 70 miles an hour, can take a motion picture of the entire route, giving the exact topographical conditions. This would permit the military authorities within twenty-four hours to conduct operations with certain knowledge as to the conditions between Albany and New York. Ultimately, it may be possible to add on the margins of the printed route maps the photographic map of the corresponding strip of territory, and thus make the reading of the map and the identification of the terrain a matter of no difficulty whatever.

An Abandoned International Convention on Aëronautical Cartography

The war prevented the holding of an international convention which was to discuss and decide on the basic principles for an aëronautical map of the world. This convention was being arranged in the United States by the Aero Club of America at the suggestion of Rear Admiral Robert E. Peary, Chairman of the Committee on Aëronautical Maps and Landing Places of the Aero Club of America. Admiral Peary attended the Tenth International Geographical Congress, held at Rome in March and April, 1913, at which the subject of aëronautical maps was discussed. The report of this congress and the principal address delivered were translated from the Italian by the writer and printed in *Flying*, the organ of the Aero Club of America, for September and October, 1913.[4]

At this congress no decision was reached or action taken towards adopting basic principles for the making of aëronautical maps, because it was recognized by the delegates, as it had been recognized by the delegates that attended the Congress of the International Aëronautic Federation at Vienna in June, 1912, that the first step to be taken should be an agreement on a scale and the conventional signs to be adopted. The aëronautical map of the world was then to be supplemented by aëronautical maps of different countries, and of parts of different countries, made on the accepted scale and with the use of the same conventional signs.

It was to bring about this international agreement that the Aero Club of America was arranging to hold an international convention in the United States, the object being to do for the world aëronautical map what was done for the international map of the world by the International Geographical Congress at Geneva in 1908. The necessary arrangements were to be made, through diplomatic channels or otherwise, to facilitate the execution of the sheets of this map overlapping the frontiers of different countries. Although the war prevented the holding of this convention, the Committee on Aëronautical Maps and Landing Places of the Aero Club of America continued its work to advance the project.

The purpose of this committee, stated in April, 1914, was as follows:

(1) To bring about an understanding between the sporting, military, and scientific authorities of different countries; and also an agreement to use uniform scales and conventional signs in making aëronautical maps.

(2) To make an aëronautical map of the United States and of the central parts of South and Central America and Canada; and to do this with the co-operation of aëro clubs affiliated with the Aero Club of America, and of aëro clubs of South and Central America and Canada.

(3) To urge the establishment of a chain of aërodromes for landing aëroplanes and landing stations for flying boats and hydro-aëroplanes, so that

[4] Giovanni Roncagli (translated by Henry Woodhouse): To Make an Aëronautical Map of the World. *Flying*, Vol. 2, 1913, No. 8, pp. 16-17 and 24, No. 9, pp. 8-9 and 30.

aviators who wish to make long flights over water or land may not be handicapped by the lack of landing places, as they are now. One of the reasons why France, Germany, and Italy have more flying than we have, is that

FIG. 5—A part of the Latin Quarter of Paris photographed from an aëroplane. The prominent building in the lower left of the picture is the Pantheon; in the right center the group of buildings surrounding a large courtyard belong to the Ecole Polytechnique. (Photo copyright by Underwood & Underwood.)

This photograph strikingly illustrates the value of photographic mapping from an aëroplane. When the view is taken vertically downwards, as in this case, the photograph is practically equivalent to a map; when the view is taken obliquely, as in Figs. 8 and 9, the photograph can easily be reduced to the ground-plan form of a map by an optical apparatus designed for this purpose. In either case the method is far more rapid and comprehensive, and less laborious and expensive, than the methods of surveying usually employed heretofore.

there are special landing places for aviators near all the cities and central towns. France alone has over three hundred landing places where aëronauts can get supplies and keep their machines over night.

(4) To encourage long-distance flying by chart and compass, as is now

FIG. 6—The San Diego, Cal., Exposition of 1915-16, photographed from a flying boat. (Photo copyright by Harold A. Taylor, Coronado.)

done in Europe. In Europe there are over 7,000 licensed aviators, and not less than 100,000 flights with passengers are made each month. In America there are only about 300 licensed aviators, and only a few hundred passengers are carried in flight each month. The distance record across country without stopping is 750 miles in Europe and only 220 miles in America; the duration record is 18 hours 10 minutes in Europe and only 6 hours 10 minutes in America. Lack of inducement alone accounts for our backwardness.

Aëro Clubs as Promoters of the Existing Aëronautical Maps

Existing aëronautical maps are mainly the result of the work of the aëro clubs of France, Italy, and the United States. The same pioneer sportsmen and volunteers who were responsible for developing aëronautics in the different countries up to the time of the war were also responsible for the first aëronautical maps. The writer well remembers how these pioneers, who are now considered as pioneers and authorities in aëronautics and are given credit for having had "wonderful foresight" at that time, in the years from 1910 to 1914 were considered visionaries. Few people were willing to admit that aircraft within fifty or a hundred years would develop to such a point that aëronautical maps would be needed for their navigation. But these pioneers went on with their work.

In 1910 officials of the Automobile Club of America and the Aero Club of America combined efforts in making a topographical map of western Long Island for aëronautical purposes. This map gave the main routes, inhabited places, and landing fields suitable for landing aëroplanes. It was very creditable work for a time when a cross-country aëroplane flight of 25 or 50 miles was still considered an extraordinary event.

The aëronautical map published by the Aéro-Club de France has already been mentioned. The sheets already issued are used extensively by the French and British Flying Corps. M. Charles Lallemand, the well-known French scientist, is the chairman of the Aëronautic Maps Committee of the Aéro-Club de France.

In Italy the work of making the aëronautical maps has been shared by the aëronautical authorities, the authorities of the Touring Club of Italy, and the members of the National Commission of Aërial Touring. The Italian pioneers in aëronautical topography include Senator G. Celoria, the chairman of the National Commission on Aërial Touring; Commander Giovanni Roncagli of the Royal Italian Navy; Signor C. Usuelli, and other well-known Italian scientists. The pioneer work of these organizations was of great value to the military authorities of their respective countries in the present war. In France and Italy the aëro clubs were practically the only sources where the necessary information about aëronautical maps could be found, as little attention had been paid to this subject by the military authorities.

An International Commission to Foster the Making of a World Aëronautical Map

Fostering the plans to make a world aëronautical map will be one of the purposes of the International Commission on Civil Aëronautics which is being organized under the auspices of the Aero Club of America, the Aërial League of America, and the Pan-American Aëronautic Federation. The membership of this Commission will include representatives of official bodies and national and international organizations interested in aëronautics of all the Allied and Pan-American countries. Officers of two of these organizations have already gone to France and while in Europe will collect data and study the plans of the Allied countries regarding aërial transportation and aëronautical maps and will arrange for the co-operation with the International Commission of aëronautical bodies and of official and scientific bodies interested in aëronautics.

Recent Commissions on Civil Aëronautics

On January 6, 1917, a French Commission of Civil Aëronautics was created by ministerial decree to study the possibilities of using aircraft for the transportation of mail and for other commercial purposes. The first meeting of this commission was held on January 30, 1917, at the Bureau of Commerce, Industries, Agriculture, Labor, and Post Offices and Telegraphs.

The membership of the Commission includes representatives of the Chamber of Deputies, the Bureau of Post Offices and Telegraphs, the Aéro-Club de France, the Chambre Syndicale des Industries Aéronautiques, and the Aërial League of France. The meeting was opened with the statement that French genius had developed aëronautics to serve the cause of civilization, but that Germany had forced France to convert aircraft into instruments of war, and that it was not too soon now to look forward to the time when, after having defeated Germany, aircraft could be used extensively as instruments of peace for transportation and for developing closer international relations. Those present were urged to look into the future and see how far the employment of aircraft could be extended. This commission is now studying the subject.

On May 23, there was announced in the British House of Commons the creation of the Civil Aërial Transport Committee, to study the possibilities of the application of aircraft to commercial purposes. This committee includes representatives of the British Air Board, the Royal Aero Club, the Government of India, the Royal Flying Corps, the Royal Naval Air Service, the Colonial Office, the Foreign Office, the Post Office, the Treasury and Board of Customs, and the Meteorological Office. Its purpose, as stated in the House of Commons by Major Bair, secretary of the British Air Board and deputy chairman of the committee, is as follows:

> To consider and report to the Air Board with regard to: (1) the steps which should

FIG. 7.

FIG. 8.

FIG. 7—A Curtiss biplane and a Curtiss flying boat flying along the Florida coast. (Photo by Goodrich, Miami, Fla.).

FIG. 8—Northern end of Miami, Florida, from an aëroplane, looking across the head of Biscayne Bay to the ocean beyond. (Photo by R. B. Hoit.)

be taken with a view to the development and regulation, after the war, of aviation for civil and commercial purposes, from a domestic and Imperial and an international standpoint. (2) The extent to which it will be possible to utilize for the above purposes the trained personnel and the aircraft that the conclusion of peace may leave over and above the requirements of the naval and military air services of the United Kingdom and the overseas dominions.

FIG. 9—The French Settlement at Tientsin, China, from an aëroplane. (Photo by René Caudron.)

The proceedings of the committee, to a large extent, will have to be confidential. The committee, I would remind the honorable members, corresponds to a similar body which has been already created in France under the presidency of M. d'Aubigny. It was set up by the Ministry of Commerce and was appointed to consider the routes to be followed in France, the Colonies, and in Allied countries, types of machines to be employed, types of postal car or carrier, bases, relay stations, and the recruitment of the personnel as well as the question of the purchase of hangars, aëroplanes, motors, etc., for the military authorities.

LORD MONTAGU'S WORLD AIR ROUTES AND THEIR REGULATION

Colonel Lord Montagu of Beaulieu, Advising Mechanical Inspector to the Government of India, who has been one of the strongest supporters of the movement to develop the British aërial forces, on June 21, 1917, gave in a lecture at Central Hall, Westminster, on the world's air routes and their regulations, a very interesting forecast of the future of the aëroplane in relation to international commerce.

He pointed out that there is a chain of British aëronautical landing places southward and eastward from Gibraltar about 900 miles from London as the plane flies towards the Cape to Egypt, India, and Australasia.

Lord Montagu brought out many interesting points, including the following:

(1) As soon as the war is over there must be national and international laws for the regulation of flying.

(2) Oversea and over-continent routes must be defined in the interests of the whole world.

(3) The winds of the world, instead of being a drawback to flying over the surface of the planet, will, if properly used, prove to be of great assistance.

Dealing with the separation of traffic in "levels," Lord Montagu said:

Now we come to the point at which we must inquire how flying round the world is to be regulated; how the principal lines of traffic are to be defined; the methods of constructing the principal aërodromes, which I will call "dromes" for short; the land-

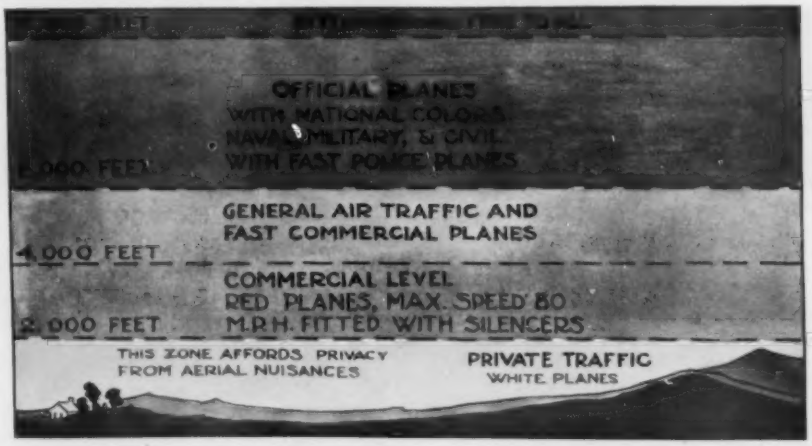


FIG. 10—Sketch showing Lord Montagu's conception of the conditions to govern aërial traffic in the near future, involving the establishment of various levels in the air. (Based on a copyright drawing in the *London Graphic* of July 7, 1917.)

ing places for safety purposes. In considering these problems, it must be remembered that we have the third dimension to help us, that is, height and depth as well as length and breadth. Air traffic will present features similar to those on both land and sea in addition to marked new possibilities peculiar to the air.

The general principle which I think should underlie all regulation of air traffic is that slow-speed planes should use the lower levels and high-speed planes the upper levels of the air. I suggest five levels, stretching from the earth's surface up to 10,000 feet, through which the various kinds of traffic should be classified to pass. The first 2,000 feet from the surface of the ground upwards should be prohibited to air traffic in general, but be usable, of course, by the private owner of the soil if he desires, and for the purposes of descending to his own landing or to "dromes" or intermediate safety landing places. This must be so, for aëroplanes will probably form one of our commonest means of locomotion in a few years' time, and provision must be made for all traffic to land at intervals of, say, 10 or 15 miles on defined routes.

In admitting the claims that any air should be private, I conform, to some extent, to the present law of *usque ad coelum*, but I propose to limit that right to an altitude of 2,000 feet. Owners of houses and land, and the dwellers upon and in them, have a moral and probably a valid legal claim to be secured some privacy from nuisances arising from air traffic. Apart from noise, there may be the danger of voluntary or invol-

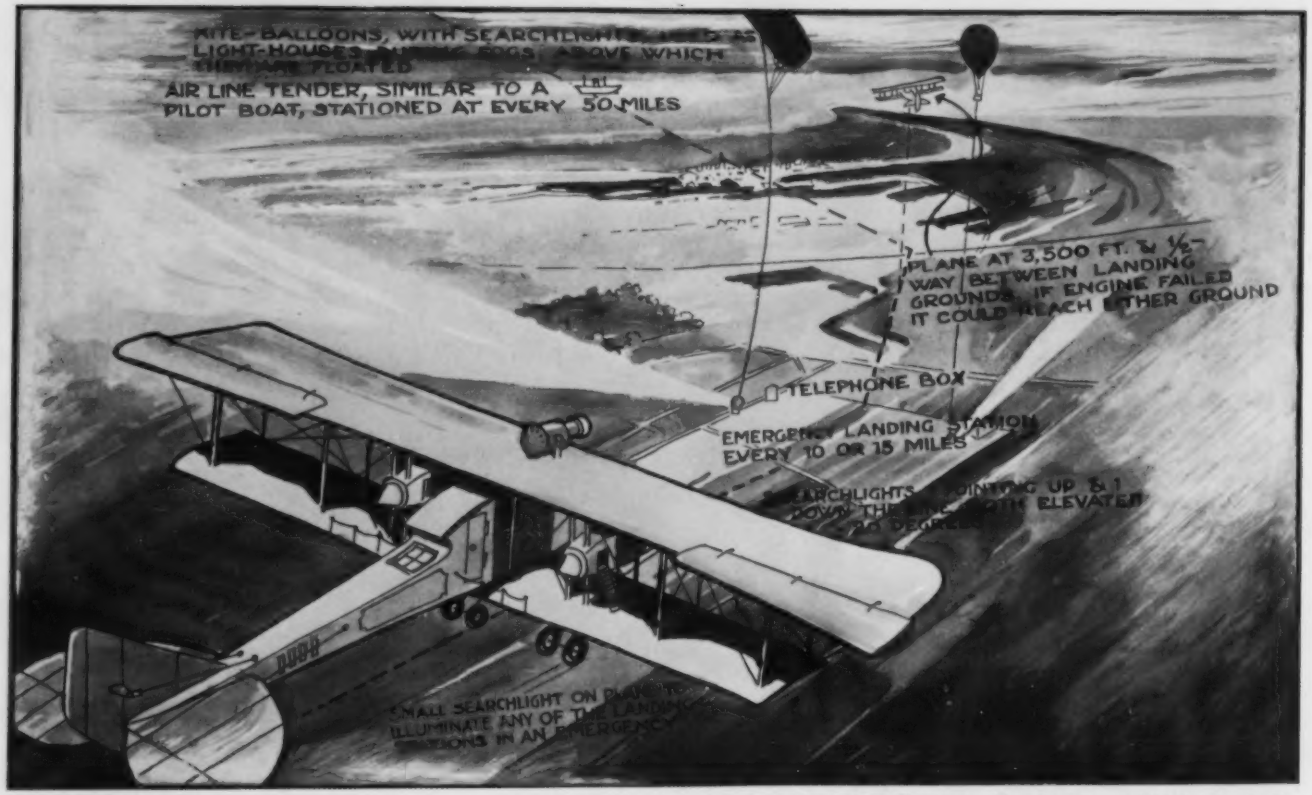

KITE-BALLOONS, WITH SEARCHLIGHTS, USED AS
LIGHT-HOUSES
AIR LINE TENDER, SIMILAR TO A
PILOT BOAT, STATIONED AT EVERY 50 MILES
PLANE AT 3,500 FT. & ½-
WAY BETWEEN LANDING
GROUNDS. IF ENGINE FAILED
IT COULD REACH EITHER GROUND
TELEPHONE BOX
EMERGENCY LANDING STATION
EVERY 10 OR 15 MILES
SEARCHLIGHTS POINTING UP & I
DOWN THE
SMALL SEARCHLIGHT ON PLANE TO
ILLUMINATE ANY OF THE LANDING
STATIONS IN AN EMERGENCY

FIG. 11—Pictorial summary of proposed traffic provisions along a commercial air route, according to Lord Montagu. (Based on a copyright drawing in the *London Graphic* of July 7, 1917.)

untary descents. When flying becomes general everywhere, without some such regulation no privacy will exist for anyone except in lonely lands or dense forests.

Above this private level we come to the commercial levels, which I propose shall range from 2,000 feet to 4,000 feet. I place this class of traffic on the lowest of the flying levels, on account of the fact that commerce will want to operate as cheaply as possible, and to achieve height and speed means extra expenditure of motor spirit, whichever way it is looked at. And I would make this 2,000 to 4,000 feet level usable by silenced planes only with a maximum speed of 80 miles an hour.

Above these commercial levels I propose another zone of 2,000 feet, 4,000 feet to 6,000 feet for planes, also silenced, capable of speeds between 80 and 120 miles per hour. This will include the general air traffic of the planet for ordinary flying, including a proportion of fast commercial flying. As all aëroplanes will shortly be fitted with superchargers, or their engines designed and built for high altitudes, high flying will become quite easy. At present the decreasing density of the air at high altitude, leading to falling off in engine power, is a disadvantage. This will shortly be neutralized so that the engine produces the same or even greater power at a height than at the earth's surface. This is, of course, a height where human health and comfort will be affected owing to the effects on the blood of decreased atmospheric pressure, such as what is called "fizzing," and the chance of faintness and heart attacks when a rapid descent takes place. The intense cold also at high altitudes will tend to keep passenger traffic, as a rule, in the lower levels, for there is a decrease of about 5° Fahrenheit for every 1,000 feet of height.

Above 6,000 feet to 10,000 feet I would reserve the levels for the official planes of each nation. These levels would be used by its naval, military, and civil forces, and by police planes, for air police will be needed in the same way that policing of routes by land and sea is now necessary. Specially authorized pilots, and perhaps postal services, will also use the 6,000 to the 10,000 feet levels, where the international levels will begin. I would remark here that unless we are to have lawlessness and anarchy in the regions of the air there must be efficient control—this is an axiom of efficiency and civilization. Control of the levels can only be exercised, nationally and internationally, by police pilots on fast planes above ordinary traffic, where, with the forces of gravity to aid, they can descend with a superior swiftness upon malefactors and breakers of the law of the air, take their numbers, or compel them to alight at the nearest landing place or drome. There must also be no unsilenced machines regularly operating below 8,000 feet—I am not sure whether that limit is high enough—for even above that height the noise of many open exhausts and the hum of many propellers may become a continuous and nerve-racking nuisance. A serious amount of unpopularity and agitation against the use of unsilenced planes will have to be faced before long.

Now we come to the levels above 10,000 feet, which I propose should be internationalized. The upper air should, I think, be free to all, under certain regulations, provided pilots comply with certain rules for meeting and overtaking and their craft passed as air-worthy—let us say, registered as A1 in a Lloyd's aërial register. This would follow the precedent, which has worked well, of the three-mile limit at sea open to all ships of all nations. Great altitudes will impose upon ordinary flying some disadvantages which will tend to keep international flying over land and over sea near the 10,000-feet limit, and flying at these levels will probably, so far as international flying is concerned, be conducted along routes to be defined by methods to which I will allude presently, and in some cases nations may agree to admit international traffic to its own levels. But if a particularly cantankerous nation objects to admit any traffic to the lower levels below 10,000 feet, the air routes will not be altogether barred. It is clear, also that there will be prohibited areas, naval and military centers, and flying over thickly populated districts will probably be avoided on account of a certain risk to those who are still content to crawl about on the earth. But, of course, this will not preclude, as I

FIG. 12—Sketch showing the use of a map on an air journey. The aëroplane is represented as approaching Washington, D. C. The map, printed on a long strip, is mounted in a holder which passes over two rollers, which can be turned so as to bring before the aviator the locality above which he is flying. (Drawing by N. E. Jennett.)

have said, the air liners of different countries using the lower levels when necessary under license from the countries over which they pass. Then, postal and passenger services may sometimes be driven down to lower levels owing to stress of weather.

Aircraft desiring to leave their own levels will, of course, use their wireless to ask permission from national or international flying authorities. But in this case they should conform, at least so I think, to the rules for silence and any other restrictions which may be found necessary in the lower levels to ensure the peaceful enjoyment of the earth's surface by its inhabitants. The problem of how to secure law and order on oversea routes is more difficult, and for this purpose it seems to me that we shall eventually have to define the paths to be followed within, say, certain degrees of latitude and longitude. It is here again that international control will be necessary, and this control must be backed by international force in the shape of air police, for without force behind them conventions and international arrangements are as futile as the resolutions of the Hague Convention have proved to be. It may be, therefore, that flying over the sea outside the three-mile limit will become a question of routes outward and homeward with no exactly defined air levels or a fewer number of levels, for there are no inhabitants to annoy over the wide spaces of the ocean, and no one to kill or annoy, barring the very remote risk to those few human beings who will still be navigating the sea in ships, probably submersibles by then.

Colonel O'Gorman's Plans for Employment of Aircraft in Transportation

Lieutenant Colonel Mervin O'Gorman, C.V., late Superintendent of the Royal Aircraft Factory, delivered a very able paper at the Grafton Galleries, London, on June 13, 1917, in which he outlined the possible use of aircraft for commercial purposes. Only a synopsis of his paper can here be given.

Colonel O'Gorman divided commercial aëronautics into three parts, as follows: (1) the home, or internal aspect; (2) the foreign, or international aspect; (3) the Imperial and Colonial aspect. He outlined the possible use of aircraft for transportation and some of the questions to be considered in connection with internal British aëronautics as follows:

(1) The uses of aircraft.
  (a) Transit of goods.
  (b) Transit of letters.
  (c) Transit of persons.
  (d) Labor of transit service.
  (e) Finance of transaërial companies.
  (f) Government subvention of aërial transport.
  (g) Private, sporting, and domestic use.
  (h) Scientific use, surveys, etc.

(2) The safety provision.
  (a) Aërial routes and lines of landing grounds; maps.
  (b) Night flying and landing.
  (c) Aërology and meteorology.
  (d) Wireless communication of distress, orders, and signals of directions.
  (e) Labor of ground upkeep, etc.
  (f) Subvention of safety precautions and grounds.
  (g) Accidents, investigation.
  (h) Keeping of records.
  (i) Insurance of (1) pilots; (2) passengers; (3) craft.

(3) Education of personnel.
  (a) Designers and engineers.
  (b) Fliers and navigators.
  (c) Military call on fliers.
  (d) Polytechnic and correspondence schools for labor.
  (e) Subvention of education.
  (f) Collation of data, research.
  (g) Inventions.
  (h) Consular trade information, etc.
(4) Production of aircraft.
  (a) Best employment of existing factory organization.
  (b) Finance and subsidies to makers.
  (c) Military and naval requirements.
  (d) Publicity and "load curve orders."
  (e) Utilization of overplus of military and naval war orders.
  (f) Supply of aircraft to foreign governments and colonies.
(5) Labor (general question).
  (a) Skilled and unskilled.
  (b) Male and female, including military, wounded, pensioned, etc.

The problems to be considered in connection with foreign aëronautics were defined by Colonel O'Gorman as follows:

(1) Post-war intergovernmental agreements (allied and enemy).
  (a) Flying rights.
  (b) Landing rights.
  (c) "Rule of the road."
  (d) Supply of aircraft to foreign governments.
  (e) International law, prohibited areas, etc.
(2) Registration of craft.
  (a) Salvage by ships and by aircraft.
  (b) Exchange of meteorological news.
(3) Post office reciprocity.
  (a) Prices for postage.
  (b) Methods of collection and delivery.
  (c) Agreed routes.
(4) Customs and policing.
  (a) Quarantine and aliens question.
(5) The formation of industrial links, co-ordinating technical societies.

Holt Thomas' "Commercial Aëronautics"

The economic side of commercial aëronautics was discussed in a paper read before the Aëronautic Society of Great Britain on May 30, 1917, by Mr. G. Holt Thomas, one of the pioneer British aëronautical authorities. His paper discussed the cost of establishing and operating air lines between such points as London and Paris, London and Marseilles, and London and Constantinople. It also outlined possible air lines across the Atlantic and from London to Ceylon, London to Tokio, London to Sydney, and London to Vancouver. Like Lord Montagu and Colonel O'Gorman, Mr. Holt Thomas expressed his belief that transatlantic air lines will be established in the near future.

Possibility of Establishing Transatlantic Air Lines

Speaking of the possibility of crossing the Atlantic, Lord Montagu pointed out

that winds of from 40 to 50 miles per hour are not uncommon in the upper air in the temperate zone, while 30-mile winds are frequent; therefore in the case of flying even a favorable 30-mile wind would add 720 miles to the day's run, while a head wind of a like speed would take 720 miles off the distance covered. In other words, there would be a difference of 1,440 miles in every twenty-four hours between a 30-mile wind favorable to the course of the aëroplane and a 30-mile wind against it—a difference so great as to make longer mileage a matter of comparative indifference. To show what this may mean I have only to state that it is about 1,800 miles from a point in County Kerry in Ireland to St. John's, Newfoundland. Assuming that an aëroplane started from St. John's with a 30-mile westerly wind behind it, and was capable itself of a speed of 80 miles per hour, the combined speed of 110 miles an hour over the surface of the globe would mean that in about sixteen and a half hours after leaving St. John's the seaplane or aëroplane could alight on the coast of Ireland. With a contrary wind of 30 miles per hour the speed of the seaplane would be reduced to 50 miles per hour over the earth's surface, and the journey would take thirty-six hours instead of sixteen and a half, or nearly twenty hours longer.

Already there exist machines which, by substituting a load of petrol for a load of bombs, could remain in the air over sixteen hours, so I am not putting forward an impossible example.

It may be advisable, therefore, in some states of the atmosphere to fly to the North American continent via Iceland and Greenland; in other states of the atmosphere via France, Spain, Portugal and the Azores. The reasons for these circuitous routes will be seen in some diagrams which I shall show you. It is clear, therefore, that meteorology and the study of wind currents is going to be of supreme importance. The knowledge of the world's atmospheric conditions and accurate forecasts, apart from their inherent scientific interest, may affect the saving or spending of millions of money annually when postal and commercial aviation is established.

Italy's Pre-eminence in Establishing Air Lines

Italy is far ahead of other nations in establishing air lines. It has had a number of air lines in actual operation for nearly a year, and Lieutenant Colonel O'Gorman and Mr. G. Holt Thomas have expressed their indebtedness to Major Perfetti, head of the special Italian Military Commission for Aëronautics in the United States, for the valuable data which he supplied them on the general subject of aërial transportation and the problems connected with international transportation.

Major Perfetti, who has accepted an invitation to become a member of the International Commission on Civil Aëronautics referred to previously, recently delivered an address in New York under the auspices of the Aero Club of America and the Automobile Club of America in which he made known the fact that Italy has been using for some time, and most successfully, huge warplanes, capable of lifting 2,750 pounds of bombs, besides the equipment in fuel needed for a flight of eight hours at a speed of 80 miles an hour. The latest Caproni triplanes are equipped with three motors of 600 horse-power each and will carry five tons of explosives and fuel for

twelve hours at a speed of about 80 miles an hour. Plans for a larger machine of this type, capable of carrying 50 passengers and of crossing the Atlantic with a sufficient load to make transatlantic transportation a commercial proposition, are being completed.

The German Plans for Aërial Transportation

In a recent number of the *Tägliche Rundschau* the German plans for aërial transportation were outlined. A company has been formed under the name of "Central European International Aërial Traffic Company." The plans provide for three main air routes, as follows: (1) Hamburg, Berlin, Vienna, Budapest, Constantinople; (2) Strassburg, Stuttgart, Munich, Vienna, Budapest, Constantinople; (3) Berlin, Dresden, Prague, Vienna, Constantinople.

Aëronautical Maps of the Future

Now that aëroplanes have grown to such tremendous size and that the leading nations are planning to use aircraft extensively for transportation, an aëronautical map of the world will become a necessity. Besides a general map of this type it will be necessary to have more detailed maps of the permanent aërial routes; and in view of the changes in the aspect of the earth due to the seasons and the change from day to night, it may be well to have different editions for summer and winter flying and for daytime and night flying.

Night flying implies that the maps will have to show the location of the special lighthouses that will be set up for air travelers as well as photographic reproductions of cities as they look at night when lighted up. The lighthouses, of course, will be the landmarks for the pilots traveling at night. Maps for winter flying will need to place emphasis on special landmarks which will have to be established and which, by contrast, will permit the air pilot to recognize the place, notwithstanding the snow.

If the plan of having different types of air traffic at different levels is adopted, then it may also become necessary to have suitable maps for the different levels, according as the speed is limited or unlimited. Aëroplanes going at 80 miles an hour and flying at a height of only 3,000 feet must have many more landing places than machines flying at tremendous speeds at over 10,000 feet. These, being engaged in international air traffic, are like express trains flying between important centers and therefore do not need detailed maps.

Now that aëroplanes are brought to the size which permits them to travel several thousand miles without stopping and now that dirigibles can navigate the air between 50 and 60 hours at a time, aërial navigation is an established fact. Furthermore, aërial navigation is the only navigation that is international in character, because no natural obstacle can prevent the progress of the aircraft as natural obstacles prevent the progress of ships and trains.

SAVING THE CROPS FROM INJURY BY FROST

By ALEXANDER McADIE
Director of the Blue Hill Observatory

"A penny saved is twice earned" said Franklin, and one can not help wondering what that wise old gentleman would say today about food conservation and especially the problem of saving crops from injury by frost. Throughout Christendom at the present moment the uppermost topic of discussion is food. Apparently the outcome of this great war will be largely determined by the supply of food. In our own land as well as in other lands every effort has been made to increase the crop yield by adding to the acreage and by intensive cultivation. Fertilizers have been used as never before, farming operations go on by night as well as by day, tractors do the work of many horses, and in every direction there is intense striving for big harvests. Those of us who are not in the field do our bit by lessening the demand, practicing economy, and preventing waste. Is it not wise, then, to study natural wastage in all its forms? For Nature herself is the master spendthrift; and the yearly losses through natural conditions, such as droughts, pests, and frosts, easily exceed the savings of the community for a long period.

Now, if ever, is the time when every effort must be made to reduce the losses by frost. The problem is one in the geography of the lower air, or, in other words, frost is largely a matter of *local air drainage*. Frost can be mastered and, indeed, has been mastered in some localities.

The word "frost" has been used in three different senses: first, a freezing temperature; second, the spicular ice crystals; and third, the damage resulting from defrosting or frosting. The first is an erroneous usage and should be abandoned. The second interests the aërographer, or student of air motion and physics, while the third, which is the proper usage, interests the plant physiologist and the public. When water vapor in the air near the ground changes its form directly into ice we get the familiar spicular or pointed crystal which most of us call frost. It does not go through the intermediate state of being water, else frost would be frozen dew, and all the flakes would be little globes. After a still, clear cold night, with neither too much nor yet too little moisture present, we find next morning crystals covering the grass and lower foliage, and most of us think, if the deposit is at all heavy, that much damage has been done. If later the plants shrivel and blacken we think that the crystals did the mischief. On the contrary, Nature, through the agency of these crystals, was trying to cause a delay or lag in the cooling. By this very same method, which we shall later explain, namely the utilization of the fact that ice has a high specific

heat compared with that of air, delicate flowers may be saved in freezing weather. It may run counter to our established notion to say that frost crystals protect vegetation from injury, but they do. The destructive factor is the fall in temperature and the consequent expansion and contraction of the plant tissue and juices in opposite directions. More frequently

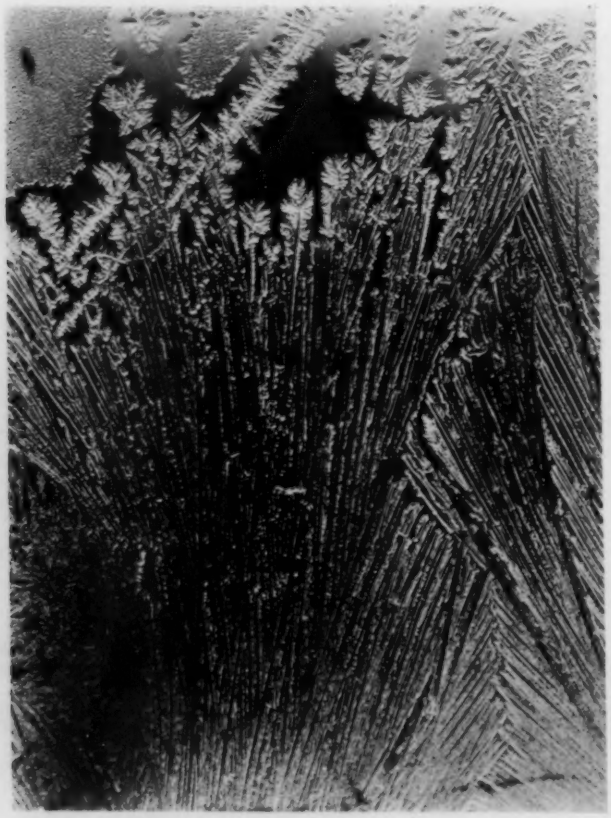


FIG. 1—The symmetrical beauty of frost lines. (All the illustrations are from photographs by the author.)

still the damage is due to a sudden rise in temperature after refrigeration. Probably it is the strain to which cells are subjected by rapid warming after chilling which does most of the damage known as frosting. It is not the freezing but the thawing which works the mischief. The writer found in the orange groves of California that in two hours the rise in temperature might amount to ten or fifteen degrees, i. e., at a rate far exceeding that at which the temperature fell, and, what was still worse, the upper side of an orange would be warm and the under side still frozen. The

damage was nearly always greatest where the fruit was freely exposed to the rays of the rising sun, and, other things being equal, a southeastern exposure was the worst. The remedy is cold water or a light smoke cloud, for we must check the sudden rise in temperature.

How shall we prevent or minimize the damage? We can do this, but not without some effort and at some expense. The fight, however, is worth

FIG. 2—Frost spicules, twice actual size.

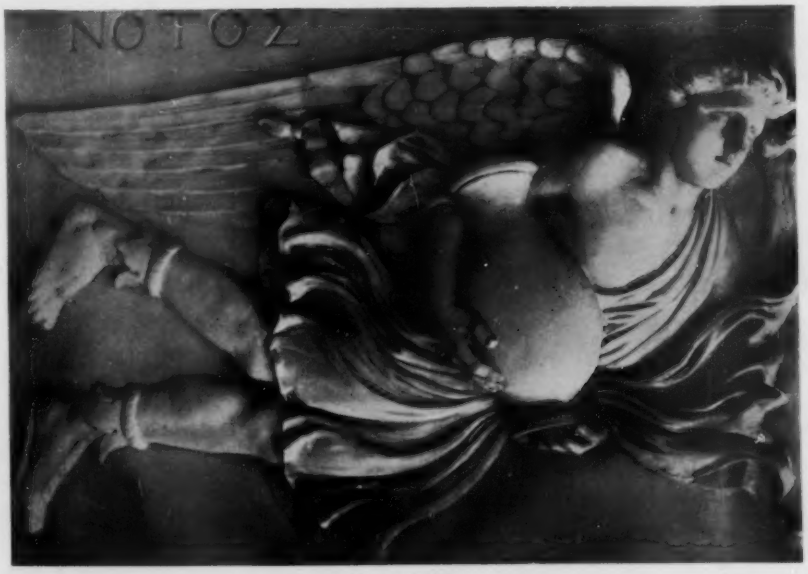
while, as has been proved by the campaigns in the great fruit belts on the Pacific Slope. A brief review of what has been done in California will encourage the doubters.

One day in December, 1895, the general forecaster at San Francisco issued warnings of frost. The press of the orange belt made merry over the warning, but, to their surprise and discomfiture, the frosts came and the losses were heavy. A few horticulturists in Riverside met to talk over the situation and the forecaster was called in for consultation. Within a month one of the members had designed and tried out a wire basket, suspended about three feet above the ground and holding about ten pounds

of coal with the necessary kindling. That was the first of modern frost protectors, the Copley coal basket.[1] Other members tried movable smudgers and heated water suppliers, and on one ranch a covering of laths was tried, which, although expensive, proved its worth. A few years later came the first oil burner for use in the vineyards near Fresno, and from this all the present forms of orchard heaters have been developed. Eighteen years later, during the first week in January, 1913, the same forecaster had occasion to issue frost warnings, but with very different results, for the press spread them far and wide, leaving no stone unturned in urging the growers to smudge and fire *early*. It was necessary, for there followed the severest weather ever known in that section; and the battle was fairly joined between Nature and Man. Man won. There were plenty of thrilling experiences in this fight, and much could be told if time and space permitted. Moreover, in this war between man and nature there can be no end, for the fighting must be renewed as long as the seasons come and go.

How does the forecaster know that frost is coming? Chiefly by anticipating for the given localities a certain type of air flow or circulation near the ground, and which is largely determined by the lay of the land. To the general movement of storm areas and the accompanying winds he must add the cumulative effect of much gentler currents, so slow indeed that they might be called "creeping" currents. When a barometric depression, or "low," as it is called, moves briskly eastward and is followed by an anticyclonic circulation, or "high," as shown by the surface isobars, the latter will at certain times seem to settle down and stay quiescent for sixty or more hours. A stagnant "high" gives results quite different from the ordinary interchange of air. There is an absence of convectional currents; there is no mixing of the different layers of air; and, to use the term of a foreign meteorologist, there is no *churning*. This lasts for two, three, and sometimes four days and nights. It is easy to see now why frosty nights follow one another, why we seldom have more than three frosts in succession and why the last night may have the lowest temperature. It is also plain why still nights are frost nights and why there are no clouds, because whatever currents there are, are from above downward rather than upward. And finally the air, since it comes from above, is dry and pure, that is, free from dust and haze; and, while perhaps slowly heated by compression in falling, still it is not heated enough to overcome the chilling which follows from contact with the cold ground. And the ground goes on cooling all the more rapidly because the air is very pure and dry. Marked inversions of temperature take place, the cold air is down and can not get up and the warm air is up and can not get down. As a result of the slow side drainage, shallow ponds of stagnant air are formed. The forecaster who has, besides his air maps, topographic maps, can follow the cold air down into

[1] For a variety of frost-protecting appliances see the illustrations in W. G. Reed: Protection from Damage by Frost, *Geogr. Rev.*, Vol. 1, 1916, pp. 110-122.—EDIT. NOTE.



FIGS. 3 and 4.

FIG. 3—The Frost King. Skiron, the northwest wind, is the driest that blows at Athens. This wind is extremely cold in winter, but in summer it is scorching, violent, and accompanied by frequent and blinding flashes of lightning; it does great mischief to vegetation and affects the health of the inhabitants. There is an air of languor in the countenance of this figure; his upper tunic is short and has sleeves which reach to the wrist; the vase he holds is of a form quite different from the water jar in the hands of Notos; it is curiously wrought and probably represents a brazen fire pot from which he may be supposed to scatter ashes and burning coals. In the United States frosts, as a rule, follow a period of gusty northwest wind, which lulls at the approach of night.

FIG. 4 The Frost Protector. Notos, the south wind, is sultry and very wet. The sculptor has represented this wind by the figure of a young man emptying a jar of water. In the United States a south wind, as a rule, obstructs formation of frost.

Figures 3 and 4 are from photographs of the casts in the library at the Blue Hill Observatory, near Boston, placed there by the founder, the late Professor Rotch. The casts are reproductions of the figures on the Tower of the Winds at Athens erected about 200 B. C.

the lowlands, for it is heavier, bulk for bulk, than warm air and unless prevented will roll itself to the bottom. The inclination of the valleys to the prevailing winds makes a difference. If the valleys are walled in so much the worse. The nature of the soil counts as well as the cover crop. Dark soils radiate more rapidly than light soils, while plowed and wet lands differ from unbroken and dry soils. Frost streaks are probably due to stagnant layers of cold air *resting* on chilled soils, for even a slow flow of the air will suffice to prevent frost. Crops on the hillsides escape for the double reason that the air is in motion and because the slopes front the level of warm air and, whatever flow there is, is from this warm level laterally to the slope.

FIG. 5—Sinuous frost effect.

We have said that the streams of cold air are very shallow—often only a few meters in depth. If we can divert or disturb these we can prevent the rapid cooling of the ground by radiation. How, then, shall we protect? A hint has been given above, namely to follow Nature. If we can not control the circulation, then spread a cover to conserve the earth heat. The cloud is the cover which Nature spreads, and even a light fleece will do the work, for there is no frost on cloudy nights, even when the clouds are high. Assuming that the agriculturist has been warned by the forecaster, what shall he do? Forewarned is forearmed, it is said; but not in this case unless the grower has prepared a supply of fuel, covering material, water, sand or fine ash, and has available labor. The easiest way

is to cover the plants with paper, cloth, straw, or mulch or make a cover of dense smoke by sprinkling water on small fires of brushwood soaked with oil. Or heat can be applied more directly by lighting many small fires or by using orchard heaters, which are metal containers holding about a gallon of crude oil. Large open fires are not effective because most of the heat goes into the higher levels, where it is not needed. The problem is to heat or displace a comparatively shallow stratum of air close to the ground. There is therefore no gain in having bonfires unless in some way a circulation can be established and warm air from above brought down. Unfortunately in most fields this is not the result, and the cold air is simply replaced by other cold air. The slight gain due to mixing and motion is not commensurate with the fuel used.

FIG. 6—Granular frost structure.

Another method is to mix the air or ventilate by blowers or windmills; but if there is much of a draft and the air is dry, some provision must be made for moistening. Other and more available methods involve the use of substances having a high specific heat, such as water, sand, or wood ashes. Of course flooding as practiced in the cranberry bogs is an old and effective preventive. On a smaller scale spraying with water that is moderately warm is good. A coating of ice does not necessarily result in injury, provided that both freezing and thawing are gradual.

For the average gardener or small fruit grower, however, the best method is that of covering. It is not exactly new, for our grandmothers knew enough to cover their favorite rose bushes, pinning paper over them and generally saving them. The one criticism is that the covering was easily displaced. The theory is simply that the heat waves re-emitted from the ground are intercepted by the cover, and the cooling of both ground and plant due to intensive radiation is stopped. It is wiser to use a more durable cover, preferably light waterproof material with proper fasteners. If

soil and plant are well watered before the cover is spread, so much the better. And finally it is an advantage to cover *early*, that is an hour or two before sunset rather than after. The method of direct heating has been used successfully in the fruit ranches of the West and Middle West; and about thirty oil pots to the acre will keep the temperature above freezing under average conditions.

Small growers as well as large growers can certainly save their crops from frost. In the aggregate the saving would be enormous.

THE VIRGIN ISLANDS OF THE UNITED STATES

By THEODOOR DE BOOY
Museum of the American Indian, Heye Foundation

After a kaleidoscopic career, unrivaled even by the ups and downs of other Antillean islands, the passing of the Danish West Indies to the rule of the United States probably marks the last change of ownership of this little group.

On his second voyage in November, 1493, Columbus sailed through the island group, which he named the Virgin Islands in honor of St. Ursula and the Eleven Thousand Virgins of the Catholic calendar. The islands were then populated by fierce Indian tribes, who resented the invasion of their shores and gave battle to the Spaniards. In fact, the first pitched battle in the Americas took place on the island of St. Croix, when the natives fearlessly attacked the landing party despatched in search of water to replenish the supply on the caravels. Men and women alike defended their shores against the invaders, and, while their crude weapons were of little effect against the defensive armor of the Spaniards, at least one of the soldiers of Columbus died from a wound inflicted by a poisoned arrow. One would almost believe that the Indians had a prophetic vision of the future annihilation of their race under the Spanish rule that was to follow.

For a considerable time after the discovery of the islands in 1493, no records speak of European settlement upon them. A century later, indeed, the Earl of Cumberland describes the islands as being "wholly uninhabited, sandy, barren, and craggy." The fate of the original population is surmised without difficulty. In the first decades of the sixteenth century it was a common practice for the governors of the nearby island of Hispaniola to send raiding expeditions to the Bahamas and other islands to supply the crying need for laborers in the gold mines of Santo Domingo. One is led to think that the Indians of the Virgin Islands were exterminated by these means. In fact, we know of a decree of Charles V proclaiming that the Virgin Islanders were to be treated as enemies and exterminated.

It was not until about 1625, so far as can be determined from the somewhat hazy records, that St. Croix was temporarily settled by a few colonists of Dutch and English nationality, and it is likely that St. Thomas and St. John also were occupied about this time. The usual strife marks this colonization, and it was not long before the Spaniards, ever jealous of other settlers in what they considered their lawful domains, put an end to the Dutch and English colonies of St. Croix by the simple means of massacring the inhabitants. Shortly after this the French made a more successful and lasting colonization of St. Croix and were able to repel the

Spanish attempts to drive them away. With some other islands, St. Croix was sold to the Knights of Malta in 1653, but was abandoned by the French settlers in 1695. The island remained practically uninhabited until 1733, when it was purchased from the French Government by King Christian VI of Denmark and was joined to the local government of the islands of St. Thomas and St. John. It continued under the Danish flag until 1801,

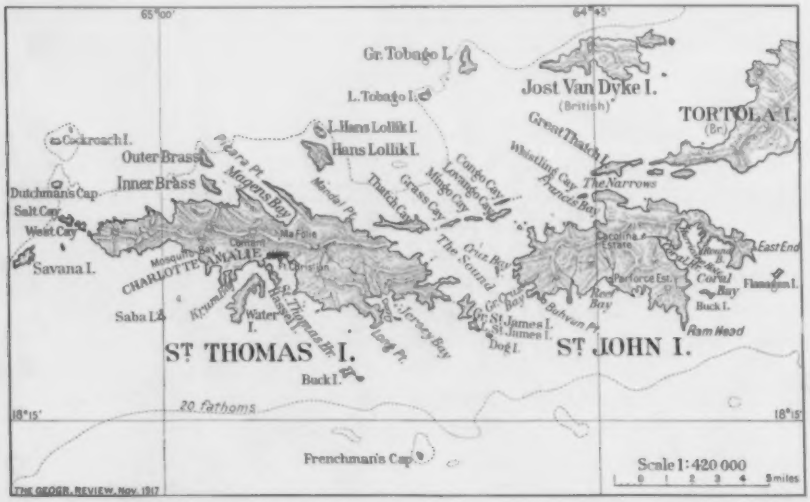


FIG. 1—Sketch-map of the islands of St. Thomas and St. John. Scale, 1:420,000. Based on Danish Admiralty Chart No. 205, edition of 1914, and U. S. Hydrographic Office Charts Nos. 1002 and 965, dated 1886.

when the islands were taken by the British forces. Restored to Denmark in 1802, the islands were again captured by the British in 1807 and were held by them until 1815, when Denmark once more took possession.

The vicissitudes of the islands of St. Thomas and St. John, while not so varied as those of St. Croix, were also startling. After the temporary occupation in 1625 by a few Dutch colonists, the islands do not appear in the public eye until the year 1671, when the Danish West India and Guinea Company of Copenhagen took possession of St. Thomas. This prosperous company was directly responsible for the subsequent welfare of St. Thomas, and through it the harbor of St. Thomas first derived its commercial importance and from it St. John was permanently settled in 1717. Outside of a few unpleasant visits by buccaneers and a negro revolt on St. John, the two islands enjoyed a period of comparative quiet and considerable, if fluctuating, prosperity until 1801, when they were captured by the British. From this date on, the history of St. Thomas and St. John is the same as the history of St. Croix.[1]

[1] See Waldemar Westergaard: The Danish West Indies under Company Rule (1671-1754), New York, 1917. Reviewed in this number of the *Review*, under "Geographical Publications," below.

The most interesting historical relation of the Danish West Indies after 1815—their relation with the United States—is well known. In 1865 the United States offered the Danish Government the sum of $5,000,000 for the islands, which offer was increased to $7,500,000 two years later. The treaty providing for their purchase was ratified by the Danish parliament but for various political reasons was cancelled by the government at

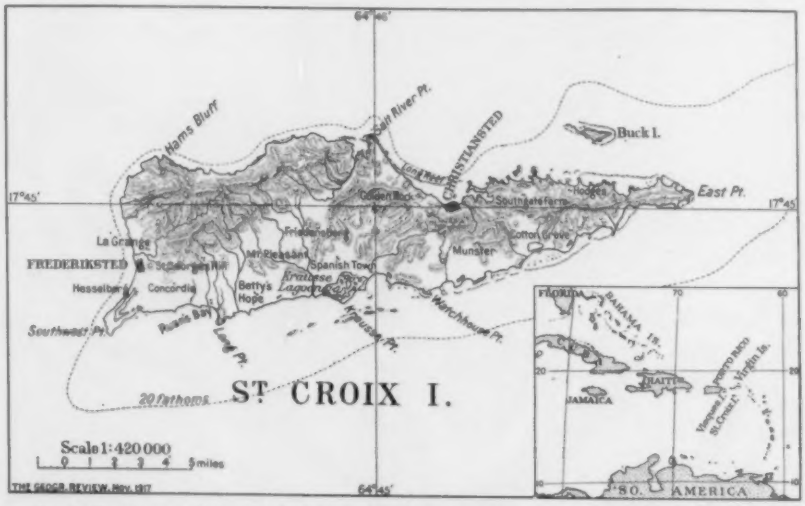


FIG. 2—Sketch-map of the island of St. Croix. Scale, 1:420,000. Based on U. S. Hydrographic Office Charts Nos. 1002, dated 1886, and 1423, dated 1894. The relation of Figures 1 and 2 may be established by noting that the meridian of 64° 45′ W. cuts both St. John and St. Croix and that the latter lies about 40 miles due south of the former. The general location of the Virgin Islands is shown on the inset.

Washington. Again, in 1902 Denmark was offered $5,000,000 for the islands, and, had it not been for German influence in the upper house of the Danish legislature, the sale would probably have been consummated. It was not until January 17, 1917, that the islands were finally sold to the United States. The sum paid was $25,000,000; and the actual transfer to the United States Government took place on March 31, 1917, when the Stars and Stripes finally replaced the Dannebrog. It was decided by the United States Government to name the acquired territory the Virgin Islands of the United States, and they are now officially known by this name. It may be pointed out, however, that the southernmost island, St. Croix, in reality was not one of the Virgin Island group as named by Columbus.[2]

While negotations between the United States and Denmark regarding the sale of the islands were in progress, considerable doubt was expressed by the general public as to their value as an investment. The argument

[2] Nor does it belong to the group physically (see note in the March, 1917, *Review*, p. 242).—EDIT. NOTE.

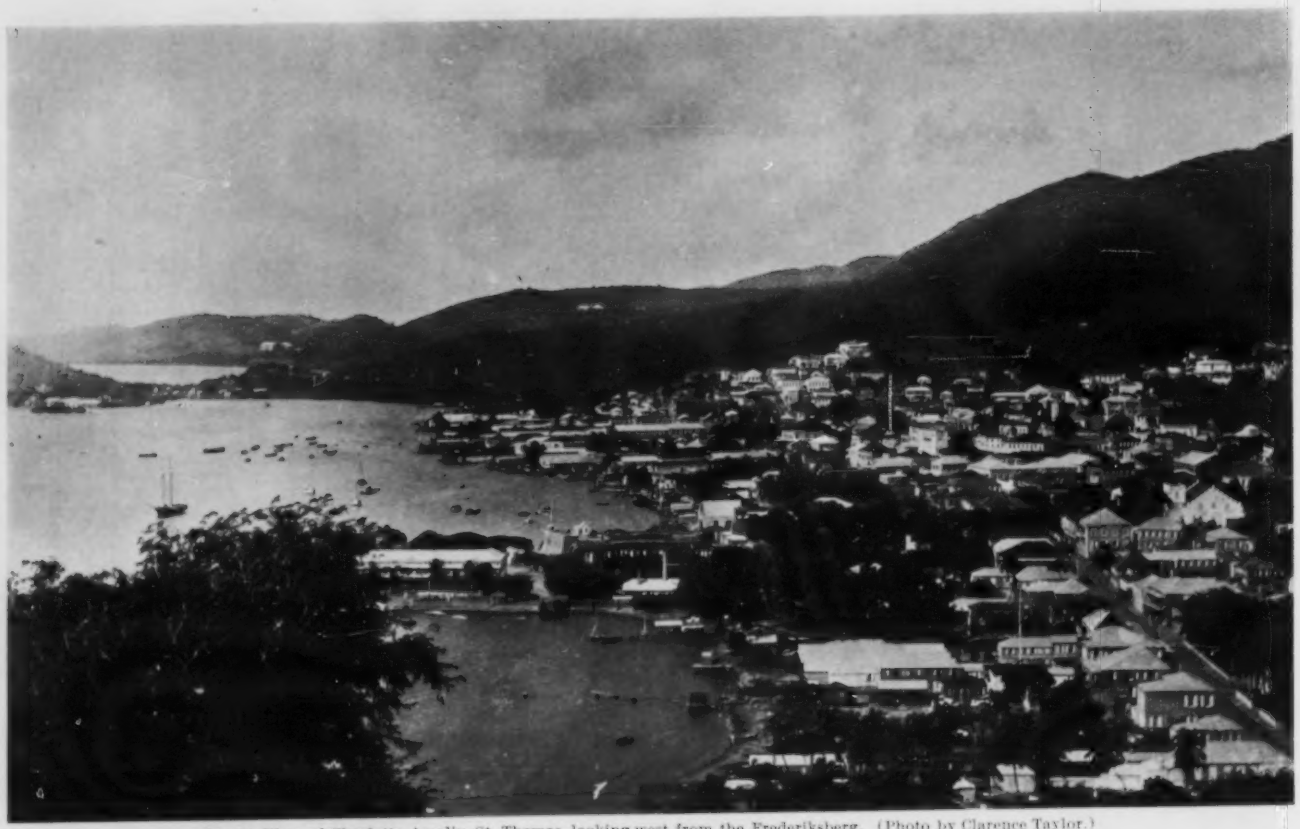


FIG. 3—View of Charlotte Amalia, St. Thomas, looking west from the Frederiksberg. (Photo by Clarence Taylor.)

was advanced that, with the exception of St. Croix, the islands were practically non-productive, and one periodical went so far as to ask its readers if $25,000,000 was not too high a price to pay for a bay rum factory. This latter remark, of course, pertained to St. John, where bay rum is produced.

Whatever may be the intrinsic worth of the islands, there can be no doubt that St. Thomas has an incalculable strategic value, and that its possession is of the greatest protection to the Panama Canal in the event of hostilities with any European Power. It lies directly in the steamer routes between European ports and the Canal Zone, and a fleet stationed in the adjacent waters, with the wonderful harbor of St. Thomas available for repairs and supplies, could dominate the approaches to the Caribbean. This fact appears to have been overlooked by those who considered that too high a price was paid for the islands.

It must of course be admitted that their mere commercial importance did not warrant so large an amount. Nevertheless they have considerable commercial value. What their resources are will be shown in the following pages, and, as the three islands are totally different in their productions, it will be necessary to discuss each island separately.

St. Thomas

St. Thomas, the westernmost island of the group, is the second largest: it measures fourteen miles in length from east to west, and is from one to three miles broad. In reality it is nothing but a curved mountain ridge whose highest elevation is 1,550 feet. The island has a population of about 10,000, of which by far the greater part are negroes. Much could be written of its people: of their amiability, of their kindness and hospitality to strangers, and of their pride in their little island. It is undoubtedly a great satisfaction to the United States that the inhabitants of St. Thomas were practically unanimous in their desire to be transferred from the Danish Government to that of Washington, and the rejoicing when the actual transfer took place was great. For, while the St. Thomians had no reason to complain of the treatment accorded them by the Danes, it was always felt that Denmark was a long way off and that in consequence a long time had to elapse before the sanction of the home government could be obtained for any change that might be desirable. Furthermore, owing to the proximity to the United States and because of the numerous American vessels that have been coming to the port of St. Thomas for coaling or other purposes, the working classes of the island are familiar with Americans and American methods. As a consequence of all this, it is not probable that the change of government will cause much dissatisfaction among the islanders or that it will be long before the St. Thomians become accustomed to the new régime.

The mountain ridge which forms the island curves northward in the

FIG. 4—Panoramic view of St. Thomas harbor and town of Charlotte Amalia, looking southward. (All photos, except Figs. 3 and 8, by the author.)

middle, leaving a corresponding basin on the south coast. It is this basin which forms the excellent harbor of Charlotte Amalia, as the town of St. Thomas is named. This harbor is unexcelled in the West Indies with the exception of Coral Bay on St. John. It offers complete protection to the largest ships, and the numerous inlets and smaller bays lend themselves admirably to the purposes of a naval base; large men-of-war may lie in the harbor itself, and smaller vessels, such as torpedo boats and supply ships, can take up positions in the inlets. With fortifications on the hills and mines in the approach to the harbor absolute safety may be insured.

Charlotte Amalia has about 8,000 inhabitants, who are mostly employed as stevedores and coal-passers upon the vessels that visit the port. Much has been written of the former commercial importance of St. Thomas when the island served as an entrepôt for the trade of practically the entire Windward Island group of the Caribbean. Upon the advent of direct steamer lines to the various islands the locational advantage waned, and St. Thomas lost a great deal of its prosperity. It is the common belief that now that the island is part of the United States some of its former prosperity will return and that the semi-deserted warehouses and docks will resound with the bustle of an increasing commerce.

The loss of commercial prestige had been preceded by the decline of agriculture, which, with the abolition of slavery, practically ceased to exist on the island. In the old days, when labor was inexpensive, sugar was raised in large quantities. This is attested by the ruins of old plantation buildings as well as by

trade figures. Many of these buildings picture the glory of the olden times, when the hospitality of the planters and their luxurious way of living were a by-word, and a ride through the island, with its views of ruined windmills and massively built mansions, is one of the interesting experiences of a visit to St. Thomas. Though a revival of profitable agriculture would not appear to be probable, much of the land could be used for the raising of cattle, for which there is always an active market.

One of the points of interest to tourists is the shipyard in Krum Bay to the westward of Charlotte Amalia. It is here that most of the vessels putting into St. Thomas harbor in distress, and afterwards condemned and sold by the insurance underwriters, are broken up. Krum Bay, in consequence, is generally spoken of as the graveyard of ships, and the owner boasts of the possession of a large number of the figureheads with which the old sailing vessels were decorated. These figureheads present a somewhat startling appearance when first seen; especially startling were they after the hurricane of October, 1916, when they lay scattered over the grounds in erratic confusion.

Automobiles are unknown on St. Thomas, as there are no roads upon which they can be used. Even carriages can go but limited distances, for the roads rapidly narrow to mountain trails, and even in the town itself there are many streets on the hillsides where a carriage cannot pass. Many of the streets are mere stone stairways, each having a big stone gutter, or "gut" as it is called in Charlotte Amalia, alongside, to carry off the water from the upper parts of the town.

The old Fort Christian, which in its later days was used as a police station and local prison, is one of the sights which no tourist to St. Thomas should miss. It is far more interesting than the so-called Bluebeard's and Blackbeard's castles usually recommended in the guide books. That it has but small strategic importance may be inferred from a complaint made by a certain Governor Iversen to one Carl Baggaert, who happened to be building a house in the year 1674. In this complaint the Governor said: "It is not advantageous to the Fort that Baggaert built his house so much higher than the Fort, insomuch that everyone who comes to him can completely overlook it." This interesting commentary, however, need not mar the visitor's enjoyment of Fort Christian; it is well worth viewing, and its cells and battlements testify to the solid methods of construction in the old days.

Nor should the tourist neglect to hire a horse and ride over the hills to the north side of the island. The ascent from Charlotte Amalia to Ma Folie, as the estate on the crest of the 1,500-foot hill is called, is startling in its abruptness. Standing on the crest, one sees to the south the town of Charlotte Amalia nestling on the slopes below and the wonderful harbor with its ships of all nationalities, its bright red fort, its floating dry dock, and all its other picturesque features. To the north one sees the

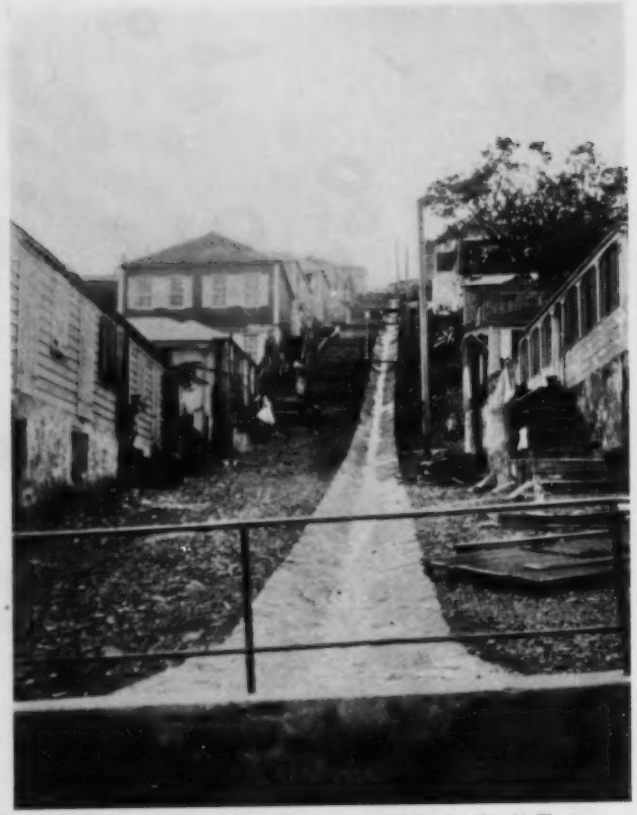


Fig. 5—Steep street with steps and gutter, Charlotte Amalia, St. Thomas.

Fig. 6—Battlements of Fort Christian, Charlotte Amalia, St. Thomas.

small islands of Inner Brass and Outer Brass, Hans Lollik, the British island Jost Van Dyke, and the deep inlet known as Magen's Bay, perhaps the prettiest bay in the Antilles. To the west one sees Crab Island, Culebra Island, and far-off Porto Rico. To the east, the island of St. John is clearly visible, and glimpses may be had of Tortola and all the other British islands of the Virgin group. Far off to the southward on clear days one can even make out the mountains of St. Croix.

The climate of the Virgin Islands is excellent, that of St. Thomas being perhaps the best. The nights are cool enough to allow one to sleep under a light blanket, and the days are very far from being oppressively hot. As a result, the inhabitants are healthy, and epidemics are rare.

St. John

The island of St. John, lying about three miles east of St. Thomas, is a little smaller in area than the latter. It is nine miles long and has an irregular breadth. The highest elevation is 1,300 feet, and, like St. Thomas, the whole island is hilly. The population consists of but 900 souls, and these lead a somewhat precarious and poverty-stricken existence.

St. John might well be termed the Cinderella of the Virgin Islands. If the average geographer be asked the name of the newly acquired Virgin Islands, he will reply: "St. Thomas, St. Croix," then pause and after deep thought add, "St. John." Published accounts of these additions to the territory of the United States make lengthy mention of the island of St. Thomas and its commercial and strategical importance, and of St. Croix with its agricultural possibilities, but dismiss St. John with a scant line or two telling of its bay trees and the poverty of its inhabitants.

The possibilities of exploiting St. John are great, however. In the first place, the bay tree flourishes on the little island. It has been found by actual experience that the bay tree is somewhat erratic and is most particular as to its habitat. Attempts have been made to grow this tree in various islands, and practically all attempts were failures. Even on St. John, small as it is, it seems that the trees do well in certain parts and are unable to gain a foothold in others. Why this is so has never been satisfactorily explained. But even with this drawback, there are today many regions on St. John where extensive cultivation of the bay tree would be highly profitable. The leaves of the bay tree are gathered and are distilled in the usual copper stills. This distillation results in the collecting of the natural oil, the bay oil, contained in the minute cells of the leaves. The bay oil is mixed with white rum in the ratio of about one quart of oil to five hundred quarts of rum, and the product is bay rum. Occasionally bay rum is made by distilling the bay leaves directly in the rum; but this method is slower and far more expensive and has practically been discontinued. The bay industry, therefore, presents one of the possibilities of St. John. While various proprietors are at present engaged in the cultiva-

tion of the trees and the distilling of the oil, there can be no doubt but that a greater exploitation of this industry would result in material benefit, especially if modern machinery for collecting the oil were employed.

Again, St. John offers great possibilities as a cattle-raising center. Perhaps no better-watered island exists in the Antilles. As a consequence, while the ground is generally steep and hilly, the slopes are covered with excellent grass of all varieties and offer feeding-grounds for thousands of heads of cattle. At the present time cattle raising seems to be neglected by practically the majority of the landowners. There can be no doubt that owing to the increased population of the neighboring island of St. Thomas through the prospective establishment of a naval station there, and also owing to the fact that no duty would have to be paid on cattle exported to Porto Rico now that the islands are under the same government, a ready market would be found for all cattle raised on St. John. St. Thomas can in no wise compare with St. John for pasturage or for water supply, and St. Croix is practically entirely given up to sugar cultivation.

The waters surrounding the numerous small keys that encircle St. John literally swarm with fish of all species. Perhaps no better fishing-grounds can be found in the Antilles than those between St. John and the keys to the westward, Congo Cay, Lovango Cay, Mingo Cay, and Grass Cay. For all that, there is practically always an unsatisfied demand for fresh fish in Charlotte Amalia. The demand for fish will naturally increase in the future. What, then, could be a more profitable investment than a suitable fishing-boat with a motor auxiliary? It could find a safe harbor in any one of the numerous bays of St. John, and with this island as a center could fish the surrounding waters and carry the catch to the St. Thomas market.

With the advent of modern intensive methods, sugar-cane cultivation on St. John would be a failure. While ruined plantation buildings bear mute evidence to the fact that St. John, like St. Thomas, was at one time a considerable producer of sugar, this was in the days when sugar was high and labor was cheap. With modern methods, St. John with its steep roads and hills could not compete with sugar-plantations on islands where flat areas make the gathering of the cane an insignificant item of expense.

But if the production of sugar would not be a profitable enterprise, undoubtedly truck-farming would amply reward anyone going into it on a large scale. The raising of all sorts of vegetables in the West Indies is a possibility which is frequently and strangely overlooked. The consumption of canned vegetables by the well-to-do of these regions is quite large, and such small quantities of fresh vegetables as are raised are in eager demand at good prices. It is a common mistake to suppose that the tropics are not suited to the production of garden truck: indeed, tomatoes, lettuce, beans, melons, etc., not only thrive, when well watered, but bear more prolifically than in northern climates. The raising of these

FIG. 7.

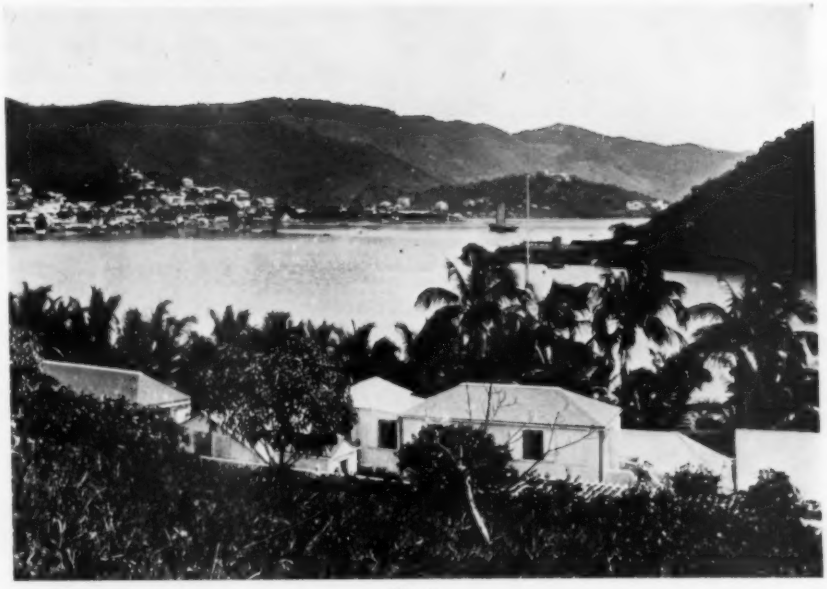


FIG. 8.

FIG. 7—Coral Bay, St. John. Tortola Island (British) in background. The white buildings are the Moravian Missionary settlement of Emmaus.

While Coral Bay, with its complete shelter from storms, its depth of water, and its numerous inlets, offers better facilities for a naval base than does St. Thomas harbor, its position with respect to the mountains of Tortola Island, upon which guns of heavy caliber could be mounted, would jeopardize the safety of a fleet.

FIG. 8—St. Thomas harbor looking eastward from foot of Careen Hill. (Photo by Clarence Taylor.)

on St. John would give employment to many, and a profitable market in St. Thomas would be assured.

It has been said that the acquisition of St. Thomas by the United States will mean an influx of travel and the erection of hotels. Here again St. John offers possibilities in many ways greater than those of St. Thomas. It is true that St. Thomas offers a busier outlook, and the ships that enter its wonderful harbor are a constant attraction. But, on the other hand, while the scenery of St. Thomas is magnificent, that of St. John excels it. Climb any hilltop in St. John and look north, east, south, or west, and unrivaled views delight the eye. The surrounding islands, of a vivid green, seem to serve only to make the line of contrast between the pale blue sky and the dark blue sea more pronounced. Surely no other island in the Antilles offers views that can compare with these in natural beauty. Viewed from a hilltop the coloring of the surrounding bays ranges from a deep blue to a light green, limited on the one side by the white waves of the reef and on the other side by the cream-colored sands of the beach. If the tourist is searching for the picturesque, it is found in abundant measure in the ruins of the old plantation buildings, whose walls and quaint staircases still exist in the tropical undergrowth. Is the tourist a lover of bathing, boating, fishing, riding, or hunting? All these sports can be followed on St. John. Is he interested in folklore or in the monuments of an extinct race? Strange tales will be told him of the uprising of the slaves in 1733 and of the ghost of the murdered daughter of the owner of the "Carolina" estate that still haunts the ancient mansion. He will be told of the three hundred escaping slaves who, when capture was inevitable, jumped from a towering precipice rather than surrender and perhaps die under the lash. Or again, a trip to the waterfall of Reef Bay, where strange rock carvings of the Indian inhabitants can be found upon the large boulders surrounding the pool, may satisfy the tourist's longing for a novel experience. Is the tourist interested in Colonial furniture? A ride through the island with frequent halts at the small cabins and huts will assuredly reward him with a "find" or two to boast of in later years to admiring friends.

FIG. 9—Indian rock-carvings, Reef Bay, St. John.

It will be seen, therefore, that St. John, the Cinderella of the Virgin Islands, has her charms and that the exploitation of the island would well repay the original outlay. A suitable tropical hotel built on St. John to entertain the sort of traveler who is content with what the country offers and does not insist upon imported food would be well patronized. Let a few young and energetic men, accustomed to the handling of West Indian laborers, start produce farms on the rich soil of St. John, and they would be certain of large returns. Let some capitalist stock a farm with a large number of cattle of a breed that will thrive in this climate, and he would be certain of a profitable investment. Let the bay tree industry be encouraged by having expert agronomists advise the planters as to the best methods of increasing the groves. When all this is done, it will be found that St. John, now only a name and a small speck on the map, will become as important as its more prosperous sisters to the west and the south.

St. Croix

St. Croix is the largest of the newly acquired islands and is 22 miles long and of irregular breadth. While the island has large flat plains, it also has one mountain ridge, the highest elevation of which is about 1,100 feet. The population consists of some 15,000 souls, the majority of whom are agricultural laborers.

St. Croix is the one agricultural possibility of the Virgin Islands. Its extensive and fertile plains make it especially well adapted for sugar cane cultivation, and those fields and hill slopes that are not given up to this purpose serve as pasturage for the numerous cattle that are used in the carts necessary for the transportation of the cane to the sugar mills. As a consequence St. Croix possesses very little waste land, and numerous large sugar factories dot the landscape with their huge chimneys.

The motoring possibilities of St. Croix are excellent, and the island boasts of many cars. A ride over one of the roads with its fringe of cocoanut trees is one of the delightful experiences lying in wait for the tourist. An automobile trip from Frederiksted, where all large steamers calling at the island anchor, to Christiansted, the seat of government, is a source of constant delight to the eye; and, while the wild magnificence of St. John is lacking, the more orderly landscapes of St. Croix are preferred by many.

St. Croix has two large towns, Frederiksted and Christiansted. Owing to the dangerous reef which shuts out the large ships, Christiansted is only visited by small sailing vessels and consequently does not exhibit the hustle and bustle so noticeable in Frederiksted on steamer days. On the other hand, Christiansted being the seat of government, its buildings are larger and more important-looking than those of Frederiksted and the inhabitants more sensible of their importance. Furthermore, Christiansted boasts of having been the home of Alexander Hamilton, and the inhabitants do not

fail to point out his abode to the visiting tourist. Both Christiansted and Frederiksted have the usual forts of a style of architecture not unlike that of Fort Christian on St. Thomas; they serve to remind the tourist of the glories of bygone times, when buccaneers, privateers, and other enemies made life interesting to the more peaceful inhabitants of the Antilles.

Perhaps the most advertised curiosity of the island of St. Croix and more particularly of the town of Christiansted is the old schooner, the *Vigilant*. No visitor is allowed to escape from the island without being told that the *Vigilant* was built in the year 1802 and served at times as a privateersman with letters of marque from the Danish Government and again at times as a Danish gunboat. Tales are told of the running fight she had, while in the latter capacity, with a Spanish gunboat in which the Spaniard came off second best. Then again the *Vigilant* served as a slave-carrier and transported human cargoes from island to island in the West Indies before slavery was abolished. Finally, in the destructive hurricane which swept over the Virgin Islands on October 9, 1916, the old vessel was wrecked inside the Christiansted reef. She was raised, however, and now serves in the humble capacity of cargo-carrier in the interinsular trade. The tourist, after hearing all this, naturally wonders how a vessel could have existed for such a long period, over one hundred and ten years, in West Indian waters, where the teredo worm works quick destruction for all woods exposed to the sea. Consequently, if questioned, the owner of the *Vigilant* will admit that parts of the vessel have occasionally been renewed, and, if hard pressed, will finally confess that the only original part of the first vessel remaining is a small eight-foot piece of the oak keel!

St. Croix has had a somewhat disturbed existence for the last century or so, owing to labor conditions. As in St. Thomas and St. John, the visitor will remark the numerous ruined estate houses. Their ruin, however, was not caused by the hand of time, but was mostly occasioned by the negro uprising of 1848, when the slaves under the leadership of one General Bourdeaux (colored) revolted and insisted upon being emancipated. Severer even than this revolt was the so-called laborers' riot in 1878, when innumerable plantations were burned to the ground and many of the planters totally ruined.

There is, even at the present time, considerable labor unrest on St. Croix. It must be said that not all of the blame rests on the laborers, and that the planters could go far, with the present prices of sugar, towards paying better wages to the negroes. However this may be, St. Croix promises to increase in prosperity under the new rule when St. Croix sugar will not have to pay the former high duty upon entrance to the United States.

In conclusion, a few words regarding the destructive hurricane which visited these islands on the night of October 9 to 10, 1916, may not be amiss. Anyone familiar with West Indian literature becomes imbued with

the idea that hurricanes of the most destructive variety are the common lot of settlers on those islands. As a matter of fact, but three major hurricanes have visited the Virgin Islands during historical times. The first one was in the latter part of the seventeenth century, the second was in 1867, and the last was that of 1916. Of course, minor hurricanes and heavy blows are not infrequent,[3] but destructive hurricanes are rare indeed. When they do occur, a bountiful nature quickly succeeds in restoring vegetation to its normal aspect; as for the destroyed houses, their flimsy construction means that they can easily be replaced.

[3] E. B. Garriott: West Indian Hurricanes (*U. S. Weather Bureau Bull. H*, Washington, 1899) enumerates fifteen huricanes as having affected St. Croix, St. Thomas, or the Virgin Islands between 1493 and 1855 (list, pp. 23-25). The same work contains a description of the storm of 1867 (pp. 52-53).

THE LAU ISLANDS OF FIJI

By W. G. FOYE
Middlebury College, Vermont

The mere mention of Fiji suggests naked cannibals dancing fiendishly about a steaming pot of boiled missionary. Nakedness is still characteristic of most of the South Sea islanders, but the missionary has conquered. Now each morning, as the sun tips the horizon, the natives assemble in hut or on boat for their morning worship, and usually a Moody and Sankey hymn forms an important part of the service.

The Fiji Islands are most easily reached by the Canadian-Australian Royal Mail line sailing each month from Vancouver to Suva, the capital of the group, situated on Viti Levu, one of the two largest islands. The voyage occupies fourteen days, including a short stay at Honolulu, that gem city of the Pacific. The international date line lies just east of the group, and the tourist has the novel experience of going to bed Sunday night and waking up Tuesday morning.

Unfortunately the average visitor to Fiji comes away with a poor impression of the islands. This impression, however, rests entirely on a knowledge of Suva, a very unprepossessing town, especially when compared with Honolulu. Its shops, arranged along the water-front, are a miscellaneous collection of brick and wooden buildings of irregular height and rectangular architecture. The residential portion of the town is built on rolling hills rising abruptly to altitudes of 300 to 400 feet. The scattered houses are given a square, boxlike appearance by reed shutters which conceal the otherwise hospitable verandas. These large shutters swing out from the bottom and are propped up in fair weather but are closed when hurricanes threaten. The residential hills are composed of fine, clayey marl which is innocent enough on dry days; but, as Suva has a record rainfall of 33 inches in twenty-four hours and is frequently deluged by cloudbursts which approximate the record, the marl is usually a slimy substance which clings to the feet persistently and has been called, erroneously but very appropriately, "soapstone."

The man who knows Fiji does not remain long in Suva but engages passage on the inter-island boat, the *Amra*, and sails away to pleasanter scenes. The *Amra*, as her name suggests, was built for the British-India trade but has long been plying between the reefs and islands of Fiji. The steamboat captain of the Atlantic has many worries, but they are not the worries of the captain in Fiji. Coral reefs have a curious habit of appearing in the most unexpected places; and, as the *Amra* is somewhat of a parcels-post ship and has to put in at the most out-of-the-way harbors, her

captain is frequently in trouble and finds his boat with a falling tide perched high on an isolated coral knoll. Frequently when creeping into port before dawn the captain approaches land with the ship's anchor half dropped, fishing as it were for bottom. As soon as the anchor grounds the engines are stopped and the ship lies to, while the large whaleboats pull away to shore and return with a cargo of copra, the dried kernels of the coconut.

The *Amra* makes a short trip every two weeks to Levuka, the old capital of the group; to Taviuni, the "Garden of Fiji," whose high volcanic ridges are covered to altitudes of nearly a thousand feet with coconut trees; and to Lambasa, on the northern side of Vanua Levu, where a broad delta plain yields an abundant sugar-cane harvest. Once a month the trip is extended to the Lau, or Eastern, Islands. Several of the northern members of this group are visited, the regular port-of-call being Loma Loma, situated on the island of Vanua Mbalavu (The Long Land), so called from its shape.

Loma Loma has lost much of its old glory. In the whaling days many Yankee sailors put in at the Exploring Isles, the sub-group to which Vanua Mbalavu belongs, and even today one of the eastern openings through the reef is known as the American Passage. During the Civil War a thriving colony of Southerners grew up. Cotton was introduced and the place boomed. Now a few stray cotton-bushes mark the waste places of the island, only two or three white families remain, and the weedy Botanical Gardens tell of the departed glory. Dr. St. Johnston, the resident district commissioner of the British government, is now endeavoring to beautify the gardens and has placed in them several old cannon captured by the natives in cannibal days from stranded men-of-war. But rarely does he have an opportunity to show the gardens or the near-by hot springs to an appreciative visitor.

There are but two types of scenery in the Lau group, that of the volcanic islands and that of the limestone islands. The volcanic islands are seldom very high. Isolated peaks rise to an altitude of 1,000 or 1,200 feet, but the average elevation is between 500 and 800 feet. They are older than the volcanoes of Taviuni, their soil has been leached of most of its goodness, and their summits have been lowered until they no longer intercept the passing trade winds sufficiently to obtain a portion of their moisture. The slopes are usually brown and seer and are clothed only with reeds. The rolling hills are occasionally broken by irregular masses of agglomerate and lava, which rise like weird sentinels over the waste. An isolated *noku-noku* tree, reminding one of a stunted larch, or a Pandanus palm, here and there relieves the monotony.

The charm of the volcanic islands lies not in the shoreward view but in the splendor of the sunlight, which almost continuously bathes the blue waters of the Pacific, and in the varying colors of the ocean. In the distance it breaks in foam over the outer reef. Between, various coral patches

FIG. 1—Village on Ongea Levu, one of the southernmost islands of the Lau group of the Fiji Islands.

dot the lagoon; and, close at hand, the coral sand dips beneath the sea, which changes from yellow to green and from green to blue until the rich indigo of the deeper waters appears.

At intervals miniature jetties extend out from the shore and curve back again; these are native fish traps serving to strand the fish as the tide goes out. Again, at intervals along the coast on the sloping beaches, reed mazes supported by stakes serve to beguile the fish. One of the exciting sports of the island is to endeavor to spear the fish entrapped in these mazes. The natives are expert in the use of long spears tipped with three straight prongs, and even on the outer reef they are able to stand on the slippery coral with the waves beating about their legs and outwit the most agile fish.

The limestone islands are built of coral débris which has been elevated 300 to 1,100 feet above the ocean. When seen from a distance their outline is that of a mesa on our western plains. A broad, flat summit descends by a series of two or three steps to the sea level. On closer approach the cliffs stand out more distinctly. They rise abruptly from a narrow, sandy beach, or even from the water's edge, to altitudes of 200 or 300 feet and are scaled with the greatest difficulty.

It is often impossible to walk along the shores of such islands except at low tide, and then only by crawling over sharp points of dissolving limestone and bending double beneath an overhanging cliff which has been undercut 5 or 8 feet by the sea. Many of the islands have central depressions, some of which contain lakes connected with the sea by a series of underground channels. Natural shafts from the surface often descend to these tidal channels. Chambers and alcoves are thus formed, and it is a weird experience to stand near tide level and see a native dive beneath a wall of limestone and appear later on a balcony far above the surface of the water.

Vanua Mbalavu combines the scenery of the volcanic and the limestone islands. Its central portion is volcanic; but a large area of limestone tips its northern end, and a smaller mass forms the southern connecting link to other limestone islands which have been separated by the erosion of a narrow strait. The limestone scenery may be seen at its best by a gallop on horseback for twenty miles along the coast from Loma Loma northward to the home of Mr. Augustus Hennings at Mba Vatu (The Rock Wall). The government is now completing a road which will make the journey much easier than it has been in the past. At first the way leads through coconut groves lining a coast formed largely of volcanic ash and agglomerate. Occasionally it passes through a native village. Ten or fifteen reed huts stand far back from the road, and hedges of brilliant hibiscus or variegated shrubs line the path on either side. Soon, as a sharp point is rounded, a group of peculiar islets appear off the coast. They are but 15 or 20 feet in height and 30 to 50 feet broad but are deeply undercut by the sea, presenting the appearance of huge mushrooms growing out of the ocean. They

are the scattered remnants of large masses of limestone which once formed the coast. Farther on the gentle slopes of the volcanic hills suddenly disappear and sharp limestone cliffs rise abruptly from the coral sands. Five or six miles more and the road leads up over the steep cliffs to Mr. Hennings' house. Mr. Hennings is the son of one of the oldest settlers of the islands and of Andi Mary, a daughter of Thakombau, the great chief who ceded the group to England. He is devoutly reverenced by the natives, and a visit to his home is ill-timed if a group of voyagers from some distant island do not appear in their communal cutter bringing gifts to their lord. Though the old tribal government is gradually breaking down, many of its customs are still maintained, especially those which tend to break the monotony of island life.

Mr. Hennings' house is built of mortar, the lime being made from bits of coral gathered off the reef. It stands amidst coconut trees near the edge of a precipice looking down into a long, narrow bay. No beach marks the shore of this bay. Unscalable cliffs rise directly from the sea. Standing in front of the house one may see sharks swimming in the clear, blue water 250 feet below. The bay of Mba Vatu is a mile long and slightly over a quarter of a mile in width. No river valleys enter it; its shores are a continuous rock wall, as its name implies. Large steamers may enter the bay and sail to its head, anchoring in the very shadow of its lofty cliffs. The beauty of the scene is striking. The dark green colors of the shaded water contrast with the white and cream of the limestone cliffs, on whose summits the waving palm trees are outlined against the sky.

A walk of half a mile across a narrow neck brings one to the "Bay of Islands." The natives call it Iloilo-ngilangila, "Bay of Mirrored Islands." Hundreds of them, great and small, dot the encircled waters, which enter between jutting points into pocket harbors. A natural balcony overlooks the bay, and through the foliage of hanging vines and tropical trees one catches faint glimpses of distant islands, while the roar of the breakers on the outer reef falls on the ear.

Life in a home like that of Mr. Hennings is delightful. The latest reviews from both England and Australia lie on the table. Tropical foods deliciously prepared by a Chinese cook are served by Hindu servants in the most approved style. One has not really seen Fiji, however, until he has made acquaintance with the natives. I hired a native boy, Hosea, who had learned a little English in a Wesleyan mission school, and together we set out to tour the island of Vanua Mbalavu. I am a geologist by profession, and my reputation was soon established. The Fijians are not unlike other peoples in believing that the lure of gold alone can account for the queer activities of one of my calling. Tuki Vatu, "Hammer the Rocks," soon came to be my name, and Mr. Hennings was kind enough to add the title Ratu—the title given the higher chiefs. The procession advanced with Hosea in the lead. Across his shoulder was poised a carrying-rod, from one end of which was

suspended a dress-suit case and from the other a rubber blanket containing bedding. The bedding is biblical in its simplicity. A small pillow, a steamer-rug, a native mat of braided bark, and a mosquito net complete the outfit. I followed behind with the collecting-bags containing a few canned goods to eke out the native fare.

Natives who have come much into contact with the whites are apt to be sophisticated and inhospitable, but in the Lau group such natives are seldom found. Thanks to a letter from Dr. St. Johnston our progress was not marred by the slightest discourtesy. The Fijians have learned to respect

FIG. 2 Undercut islets of coral limestone at Ongea Bay, Lau group of the Fiji Islands.

personal property and rarely take what is not theirs, if food be excepted. Food is held to be common property, and servants, unless given strict orders to the contrary, consider it entirely proper to help themselves to the canned goods. *Mbulamakau* is especially appreciated. That word may appear strange to an American eye, but a little reflection will show that the natives did not distinguish between the two English terms "bull" and "cow," and hence all beef is called by a compound title.

On entering a village the first man to be sought is the *turanga-ni-koro*, the elective head of the community. All Fijians have a genius for shaking hands, hence it is frequently necessary to greet the whole village before their chief appears. They approach deferentially, their body half bent forward, and one by one grasp your hand as they give the native greeting, "*Sa mbula*," two words which constitute half of the Fijian vocabulary. The *turanga-ni-koro* seldom reads the letter of introduction; not because he cannot, but because it is beneath his dignity. After the contents are

made known his welcome is renewed, and a boy is dispatched to tell his wife to prepare her house.

There are three types of houses in Fiji, but they all have certain characteristics in common. They are always 15 to 18 feet wide and 20 to 25 feet long. They stand on raised embankments slightly larger than the house and held up by walls of rounded boulders. Their front door-steps are fashioned from a log, notched to accommodate the grasping toes of a native but dangerous for English boots on a muddy day. Three doors are cut on as many sides of the house, one end being left intact. The walls are so low that even a man of ordinary height must stoop to enter the doorway. The Tongan house has reed walls woven in an attractive fashion and usually free from vermin. The ends of such houses are rounded, differing from the ends of the Fijian houses, which are square. The walls of the true Fijian house are built of grass, bound into a mat a foot in thickness. Such walls are protective against the heat of the tropics but become musty during the rainy season. Furthermore they are usually the nesting place of mice, which disturb the slumbers of even the weariest of wayfarers. Cockroaches, two inches in length, are also common; but as they are found even in the best houses of Fiji no apology need be made for them. A third type of house has a thatch of braided palm leaves. In some cases the reed houses have roofs of this thatch, and occasionally it is continued to the side walls.

The massive beams which support the houses are wound with *mangi-mangi*, a rope braided from the shreds of coconut bark. Here and there white cowry shells are attached to the rope to decorate the interior. Occasionally the ridgepole is ornamented in a like manner. A raised platform, two or more feet in height and seven feet wide, occupies the entire closed end of the house. Braided mats of bark cover the hay which is laid over the floor as well as over the platform. Brilliant yarns fringe the edges of these mats where they hang down. Above the platform a mosquito net is hung from the roof by its four corners with bits of colored tape sewed in about its edge. This end of the house is the sleeping compartment. Four or five of the family find repose beneath the net, while the others sleep on the floor. The articles of furniture are very simple; a wooden pillow similar to those used by the Japanese, a Chinese wooden chest, occasionally a table, and frequently a hanging lamp. The few dishes are tucked into the walls or rest in the sun on a raised stand just outside the door. A huge wooden bowl (the use of which will be explained later) occupies a conspicuous place on the wall.

As soon as the goodwife has swept the mats and removed the baby to the cookhouse in the rear, the hut is ready for occupancy. Hosea replaces the native mosquito net, which is full of holes, with my own and arranges the bedding. These duties are hardly finished when the ceremonies begin.

A root of *yangona* or kava is presented by the elders of the town with

much palaver. The root is then taken outside the door and cut into bits an inch or more in length. These pieces are crushed in a wooden mortar (formerly they were chewed by the maidens) and infused with water in the large wooden bowl just referred to. When the infusion is complete it is strained through a mass of fibers from the paper mulberry tree. The master of ceremonies then claps his hands five times, holding the mulberry fibers between his palms. A huge half coconut shell is brought and filled by wringing the fiber into it. The cup is then passed to those present in order of rank. The beverage looks like dirty dish-water; to the palate it is an electric shock; but as nothing in Fiji quenches thirst so effectively as this drink, its disagreeable taste is soon forgotten. It is always well to have an understanding with the master of ceremonies beforehand in order that Fijian etiquette may not be shattered. It is exceedingly impolite to remove the cup from the lips before it is emptied. Since a pint of kava is not easily drunk at one draft, it is well to signify how much can be drunk; otherwise the cup is sipped like tea amidst a group of smiling natives.

After the *yangona* cermony is over the women assemble outside the house and come in one by one bringing offerings of cooked vegetables on platters of braided palm covered with banana leaves. The leaves are placed on the floor and the food is assigned to the various groups present by the *turanga-ni-koro*. The last woman who enters always bears a pot; and thereby hangs a tale. That pot may contain a chicken or it may contain prawns cooked in coconut oil. The latter dish is most delicious, but the former cannot be mentioned without pain. One short half-hour before the chicken was enjoying life. He was run to death by a small boy, thrust into the boiling pot—stripped of little else but his feathers—and placed on the table (consisting of an extra mat on the floor) with one glazed eye looking sadly up as though inquiring what sin he had committed to merit so untimely a death. The vegetables vary in their attractiveness. A bit of *ndalo* (taro) is palatable when well cooked. *Kauai*, or tapioca root, is not bad but rather too shreddy for most persons. Breadfruit roasted in the coals tastes like roast chestnuts. Boiled *cumalas* resemble boiled sweet potatoes but are usually too salvy for Europeans. Boiled green bananas are too bitter for the ordinary taste.

The evening after the meal is devoted to a discussion of the war. Most of the natives read a little and are intensely interested in filling out their own ideas concerning the great struggle. They obtain a bare outline of the events from the *Na Mata*, a monthly magazine edited by Mr. Allardyce of the Native Department of Suva. Several *mékés*, or motion dances, have been invented by natives to commemorate special events which have struck their fancy. One such *méké* depicts a fight in the air between a Japanese and a German aëroplane. The Japanese warrior wins and the song ends with three lusty "Hip-hip-hoorays." Before the evening is over several of the maidens with their hair braided down over one shoulder perform

FIG. 3.

FIG. 4.

FIG. 3—Harbor of a limestone island (Tuvutha, a northern member of the Lau group of the Fiji Islands).

FIG. 4—Framework of a Tongan house, Loma Loma, a village on Vanua Mbalavu, the northernmost island of the Lau group of the Fiji Islands.

one of these dances. They sit in a row on the floor with crossed legs and bend gracefully back and forth as they extend their slender arms in perfect rhythm to a measure beaten on sections of bamboo by several small boys. At first these dances are entertaining; but, as the Fijians like to prolong their concerts to three or four o'clock in the morning and repeat them without change several nights in succession, they soon become monotonous, especially since there is no way to get rid of visitors except by turning them out of the house. As the dances are given in honor of the guest, it would not appear exactly proper for him to treat his host so inconsiderately. Nevertheless it is soon found that the removal of a shoe, or even a quiet nap, is not taken as a hint to withdraw, and at last the tedious songs have to be ended by the announcement that the *papalangi* would like to be left alone that they may sleep.

It may well be seen that life in a native village is attractive at first but soon loses its charm. What is true of life in a village is doubly true of life aboard a native boat. The many tales of the beauty of Fulanga led the writer to engage a cutter and voyage nearly 200 miles southward to this remote island. The cutter was owned by the Wesleyan society of Australia and was commanded by Capitani Tevita (David), a jolly seaman but a sore trial. He had the social disposition of all the natives and could not find it in his heart to pass an island without a short visit to his friends. The days of travel were hence numbered by the islands passed. He always had plausible reasons—a sail was torn, the rudder needed mending, or a hurricane threatened; but the real reason was usually the booming signals beaten on a hollow log, proclaiming that a feast of roast shark or some other dainty was prepared ashore.

Sailing on the *Lotu Wesele* was very enjoyable as long as it did not rain and as long as the wind continued to blow. To toss about in one spot on the Pacific, however, is not conducive to happiness. The scorching sun pours down on the flapping sails and makes the cabin unbearable. Even a faint breath of air moving over the ocean is a comfort. There are no chairs, and so you sit and read with your legs extended on the heated deck. Soon reading becomes tedious and sleep overcomes you. And when you wake you find that even sleep has lost its efficacy. Or, again, a gale is dashing the spray over the ship's side. There is no retreat but the cabin. The hatch is pulled tight and you are crowded in with the natives and all their smells. Several wreaths decorate the cabin wall. Once they were fragrant, but now their stale odor is mingled with those of kerosene, cocoanut oil, and vile tobacco, for the Fijians, both men and women, smoke the strongest tobacco known to mankind. The combined effect is a good deal of a strain for the normal human stomach, and life is no longer rosy.

The first stage of the voyage from Loma Loma to Fulanga is the sail out of the Exploring Isles to Lakemba, the old capital of Maafu. Maafu was a Tongan conqueror who wrested the Lau Islands from the Fijians and

would probably have laid all Fiji under tribute had not his course been checked by the cession of the islands to Britain. The sail occupies half a day with favoring winds and three days with adverse winds. Captain David occupied eight days in visiting his friends, baptizing babies into the Methodist communion, and resting on the Sabbath, on which day no Christian will sail a boat in Fiji—unless well paid for his trouble. At last Lakemba was sighted and all were glad to be rid of the confinement of the boat. The Tui Naiau (King of Naiau), a direct descendant of Maafu, welcomed us, and Mr. Amos, the head of the Wesleyan missions for Lau, invited the party to a turkey dinner at the mission school, beautifully situated on a hill scarp overlooking the harbor.

After a rest of a few days, in which a number of the marvelous domes in the limestone caves about the edge of the island were visited, Captain David was persuaded to leave his friends, and again the *Lotu Wesele* set sail. The nights were still made hideous by beds of hard wood and sudden showers, but the days were glorious with their brisk winds and bright sunlight. The ship now and again sailed swiftly by the edge of a reef; a trawling line was let out astern, and a queer fish, shaped like a small torpedo and colored blue and yellow, was caught. It weighed 60 or 70 pounds and relieved the monotony of curry and rice alternating with Campbell's soups. Small islands were sighted, uninhabited except by a few stray goats which, with the pigs, are all said to have descended from ancestors that sailed with Captain Cook.

The first hint that we were nearing Fulanga was the appearance in the distance of a native outrigger canoe with a mat sail. She swiftly came alongside, and we wondered at the confidence of these people who ventured so far from land in so frail a bark. The canoes are much swifter than the cutters, and natives often prefer to sail from island to island or even from Fiji to Tonga in their canoes rather than to depend on the slower passage of a cutter. The government, however, is now preventing such voyages, since many lives have been lost in the sudden hurricanes of the region. Entering Fulanga harbor in a fifteen-ton cutter is an exciting experience. On either side projecting ledges of coral are barely covered by the inrushing tide. Their sloping surface is laid bare as each wave recedes, and the huge, green, fungus-like masses of living coral which mark the outer edge of the reef are constant reminders that a wrong twist of the tiller would dash the boat to pieces on the treacherous bar.

Few Europeans have seen Fulanga, yet it is one of the most beautiful spots in Fiji. The entrance to the bay was so narrow that Alexander Agassiz, passing in his steam-yacht, the *Yaralla*, was unable to enter. On either side of the entrance islands of uplifted coral limestone rise to altitudes of 50 to 100 feet. They have been undercut by waves beating against their bases from both the open ocean and the lagoon, and their triangular masses rest on broad pedestals like white haycocks on a salt

marsh. Once inside the almost continuous, circular rim of the group of islands about the lagoon, the whole lagoon is seen to be dotted with undercut islets. To one who stands on the higher crescentic island which forms the southwestern portion of the outer rim and which rises to an elevation of 250 feet, the many smaller islands resting on the smooth waters of the lagoon present a marvelous picture in the sunlight. Around the shore solution pits in the limestone are abandoned by the sea at low tide. In them rest large starfish, rich indigo blue in color, while minute blue-and-gold fish dart in and out among the heads of growing coral.

The whole island is a fairy land of weird beauty; but it soon appeared that beauty and happiness do not always keep company, for the people of the island were near starvation. A recent hurricane had destroyed their coconut trees, and drought had prevented the development of the ordinary quick-growing crops. They were living on the dried pods of the *ndongo* tree, which resemble those of the catalpa. The government later furnished them with rice. While on the island we were forced to drink coconut water, since the cement cisterns built by the government were empty. The poverty of the natives did not detract from their hospitality. A chicken was found and was really better cooked than at any other place we visited. The usual ceremonies were performed, and a rare bit of tapa cloth, beaten out of the bark of the paper mulberry tree and decorated with native dyes, was presented.

The limestone islands about Fulanga are noted for their large, native mahogany trees. A white wood known as *vesi* is also common. The two woods are worked up by the native wood-carvers into combs and pillows. The combs with their long teeth are the only effective means of unraveling the long, kinky locks of the Fijians and are assiduously used in producing the odd head-dresses so carefully wrought out. The hair is further beautified from time to time by the use of a thick paste of lime which changes its natural black to a door-mat red hue.

One evening the house in which we were staying in Fulanga was visited by the native missionary. It is the custom for him to conduct a prayer meeting once a week at some house in the village. The missionary was tall and thin. His white cotton *sulu* (waist-cloth) and white coat set off his figure to good effect. His thin whiskers gave his face an Arabic look, for the features of the Tongans are often quite Caucasian in their regularity. A song was sung,

Sere tale mai kivei au,
Vosa ni mbula nga.
(Sing them over again to me,
Wonderful words of life.)

The pastor then offered a fervent prayer, including a request that the Good Lord would watch over and bless the strangers. Even the hardest heart could not help being touched by the simplicity of a Fijian prayer.

After the meeting we spoke of the old days; but it was useless to try to persuade the pastor to tell of the cannibal feasts he had witnessed. The older Fijians are usually much ashamed of their past history and will rarely mention it. The younger generation are less delicate but seldom tell the truth, choosing rather to relate a pleasing tale. Some of the old heathen moral standards still exist, and the upward progress of the race is slow. The government educates a few in its school near Suva for clerical positions of minor importance. The Wesleyan church is conducting a very successful trade school, but for the masses there is no organized education above the village school conducted in a haphazard way by the native preacher. A little reading, writing, and arithmetic comprise their education. Their religion is largely emotional, as might be expected. Long prayers, long speeches, and much singing are the measure of religious experience, and few allow their religion to interfere with their daily life. Yet when it is considered that the race is but thirty or forty years removed from cannibalism, the transformation effected largely by the Wesleyan church is truly wonderful.

The Fijians are a happy, childlike race, kind to their friends and never violent to their enemies unless they can sneak up behind and deliver a blow without danger to themselves. They will take any amount of verbal abuse without a murmur, and nothing is more provoking than the calm smile with which a servant receives the most vehement scolding. A happy and long life with plenty to eat is their ideal, and ambition is nipped in the bud by a spirit of communism that forces everyone to share his gains with the rest of his class. Even a watch or a coat must be relinquished if a superior merely asks for it. Yet withall, there is a lure about the tropics which is not easily resisted even by a race with higher ideals. Desire for ease and love of beauty are inherent in all of us, and the harsh struggle for existence in a colder climate has led many a man with shattered hopes to find a home among the care-free children of Fiji.

THE DISTRIBUTION OF BRITISH CITIES, AND THE EMPIRE

By MARK JEFFERSON

The keynote of the diagram of the cities of the United Kingdom on the next two pages (Fig. 1) is that they occur in *swarms*. Four outer swarms at London, South Wales, the Clyde, and Newcastle surround a central group of swarms in the Midlands. Each of these swarms, except the London one, is on a coalfield. Of the 415 British cities outside of the London Basin, 307, or 74 per cent of them all, are so situated. This is unique.

England's supply of coal is unique, too. Figure 2 shows the coalfields as well as the 40 cities of more than 100,000 people.[1] The double-page map includes smaller ones down to 10,000. England's supply of coal is unique because she has so much in so small a space. The following table contains data to emphasize this point.

	Area in Square Miles	Coal Production, 1911, in Million Short Tons	Exports of Manufactures, 1912, in Million Dollars
United Kingdom	121,633	304	1874
United States	3,026,789	496	1020
German Empire	208,780	258	1430

We are wont to say the United States leads the world in coal production. We should note, however, that the United Kingdom has but a twenty-fifth as much territory as the United States. The facts are that it produces about 60 per cent as much coal from 4 per cent as much land, or about *fifteen times as much from equivalent areas*. For every square mile of territory the United Kingdom produced 2,496 tons of coal in 1911, Germany 1,236 tons and the United States only 164. It is true that the United States produces more coal than any other country in the world, yet, if its area is considered, it is simply not in the same class, as a coal producer, with the United Kingdom. That is what is meant by calling England's coal supply unique. It has no peer.

The swarming of British cities on the coalfields, too, is unique. Neither Germany nor the United States has anything like it. Germany has a single swarm of cities on the Ruhr field, the admiration and wonder of all German students. There are to be found 11 of Germany's 47 cities of 100,000. But of Britain's 40 great cities 27 stand on the coal, 67 per cent against 23. The United States has only two of its great cities, Pittsburg and Scranton, on

[1] By "cities" are here meant geographical cities, i. e., continuous population centers irrespective of administrative divisions: thus Gateshead is included in Newcastle, Birkenhead in Liverpool, Salford in Manchester, and the London suburbs in London.

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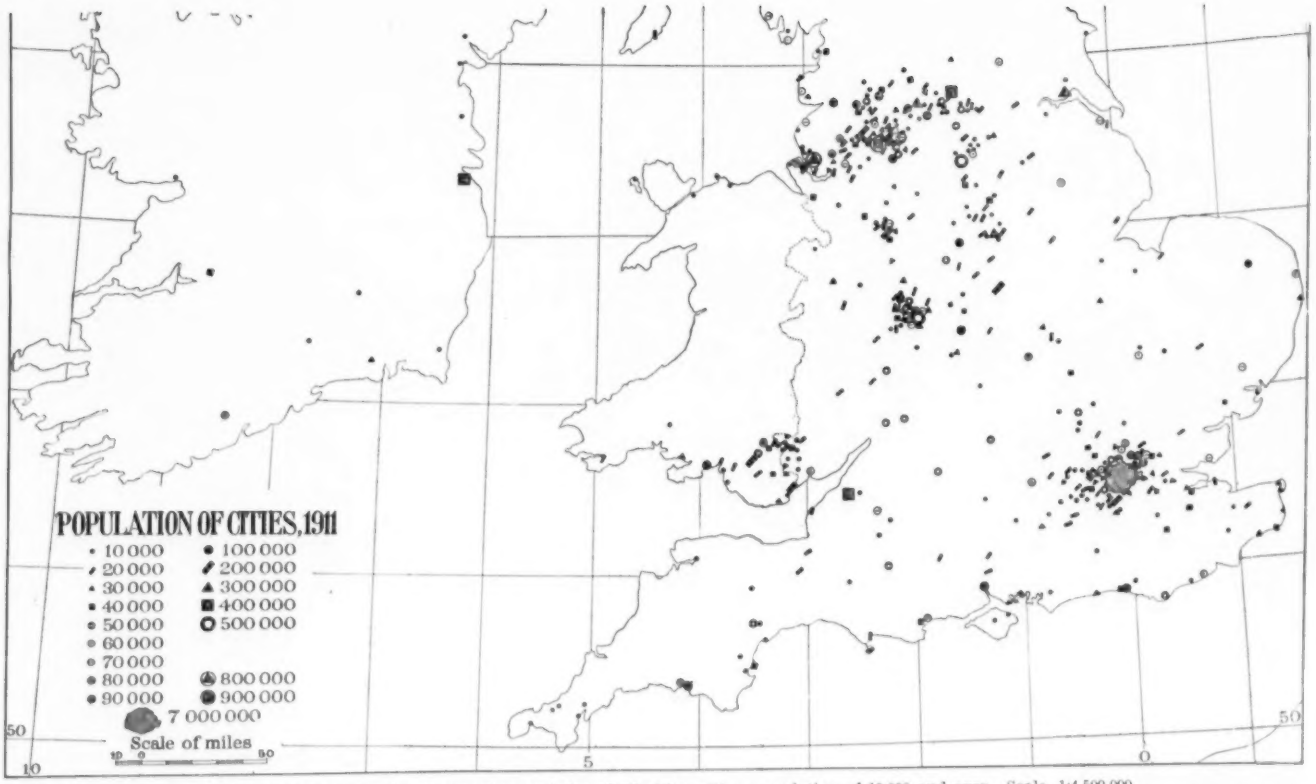

FIG. 1—Outline map of the British Isles showing the location and size of all cities with a population of 10,000 and over. Scale, 1:4,500,000. The map strikingly illustrates how the cities of Britain swarm on the coalfields (for location of coalfields, see Fig. 2). No other country has anything to equal it.

the coal, or 4 per cent. Of 533 cities in the United States above the 10,000 size, 111 stand on the great coalfields. There is a single little swarm of 18 on the Scranton anthracite field. The 111 may be divided into five groups, 18 on the anthracite, 42 on the Appalachian, 7 on the Michigan, 21 on the Illinoisian, and 13 on the Missourian fields. None of these but the Scranton group has any semblance of a swarm. It would not be possible at all to infer the location of any of the other fields from any concentration of the cities on the map. The coalfields have not really controlled the location of most of them. In the Michigan field, for instance, are Bay City, Saginaw, Flint, Owosso, Lansing, and Grand Rapids, and only the first two burn any Michigan coal. The only large city among them is Grand Rapids, which gets all its coal from outside the state. At the most one can say that 20 per cent of our cities are on coalfields, and 3 per cent (18 cities) show perceptible concentration there.

The United States and Germany may be said to use coal for manufacturing, but of England we must say that her coal treasures drove her to manufacturing, and the marketing of the product created her empire.

As an empire, the British Empire happened without anyone's intention, but there were geographic, as well as racial and moral forces behind the events that brought it into being. Official name it has none. The United Kingdom of Great Britain and Ireland has a parliament that regulates affairs in the British Isles and the dependent parts of the Empire. Other parts govern themselves absolutely. One calls it all England, nine times out of ten, England had so dominant a part in making the empire. However much an Irishman, a Scot, or a Welshman might be annoyed to be called English, he would never dream of claiming the Empire as Irish, Welsh, or Scotch. Today there are 34,000,000 English, 5,000,000 Scotch, 4,000,000 Irish, and 2,000,000 Welsh: three times as many English as all the others together. Men of all three races have made splendid contributions to the story of England, but it remains withal an English story.

There was room enough on the fertile plains of southeastern Britain to support an abundant population from the home soil. It is the best part of the kingdom agriculturally, but its crowning advantage as the home for a nation is its separation from the north-central plains of the Continent by the Channel's "silver strand," which saved it from the incessant invasions that have been the fate of every part of the plain on the mainland. England had its early invasions, Roman, Danish, Saxon, and Norman, but for long centuries now no invader has crossed the channel. Through this period the English nation has developed its independence, created its factories and the mechanisms for manufacturing and for transportation on land and sea, has won the lordship of the sea paths, and fared forth on them to the ends of the earth with the wares of its factories. These wares and this trade have needed the Empire, and, needing it, have created it.

The Empire is new. In 1600 England was not even united with Scotland or Ireland. Beyond the English border only Wales and the Channel Islands were owned, though there were pale beginnings of settlements in Newfoundland. But England had fought the Invincible Armada and won

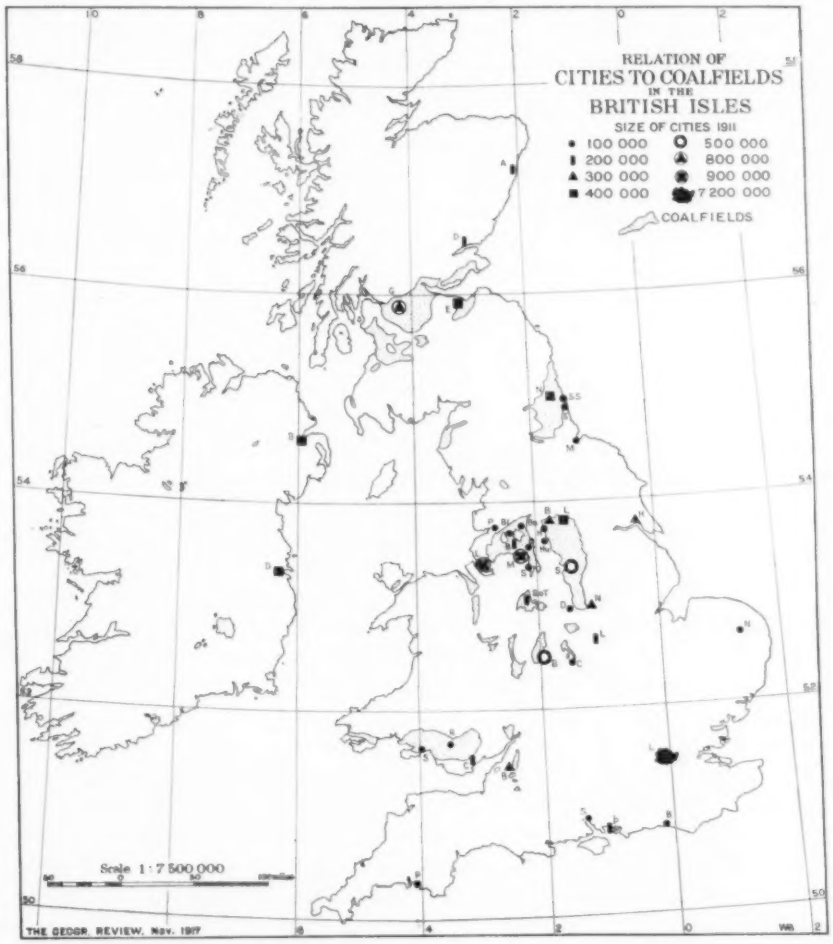

FIG. 2—Outline map showing the relation of cities to coalfields in the British Isles. Scale, 1:7,500,000.

from it the mastery of the sea. Her beginnings were made. A century later all Britain and Ireland were united, colonies extended along the American coast from Maine to Georgia, and Bermuda, the Bahamas, Jamaica, Antigua, and Barbados in the West Indies were all English. Moreover, firm foundation had been laid for an Indian Empire in the three commercial settlements at Calcutta, Madras, and Bombay.

Probably English character was powerfully influenced toward independence by the long freedom of English soil from foreign invaders. Not even the tradition of foreign soldiers burning, destroying, and ravaging on English soil exists. It is a striking fact that through the period of the Napoleonic wars, when French armies entered every town in Belgium, Holland, and northern Germany, the Channel and the English fleet kept England uninvaded, precisely in the years when the mechanical improvements in spinning and weaving, and the invention of the steam engine and the locomotive, introduced the industrial revolution. For these inventions all European industry was ripe, but only England had peace and tranquillity at home to develop them. In that last half of the eighteenth century England annexed eleven important colonial tracts, six and a half million square miles in all. In the first quarter of the nineteenth she added ten more tracts, measuring another quarter of a million square miles. Meanwhile France, who had made her colonial beginnings in the Antilles and India in the seventeenth century, added nothing from 1700 to 1830.

In the English development the flag followed English trade. Trading companies or individual traders prepared the way unwittingly for the great empire of today. One can hardly doubt that the impulse behind all this trade was the increasing product of English factories in an epoch when industrial progress was impossible to the war-harried peoples of the Continent. Napoleon's ambition for a continental empire had for its chief result the establishment of English manufactures, English trade, and the English empire beyond the seas. Today, when all the world is entering the commercial arena, when Germany and the United States are drawing close to British achievements, Britain is greatly sustained by the powerful momentum of her start and the possession of her Empire.

This conception of the British Empire as the direct result of English trade in English manufactures, which in turn are largely a response to English treasures of coal and iron, is strongly re-enforced by the distribution of her great cities. It has been said above that of the 40 cities with more than 100,000 inhabitants 27 stand on the coalfields. Twelve are seaports, and Norwich, a single one of the forty, is neither seaport nor coalfield town. The United States has 2 on its coalfields, while 35 like the English Norwich are distant from both sea and coal. Over against Germany's 11 cities on the Ruhr coalfield are 36 great German cities away from coal and sea. Cities of this size are the great foci of the nation's activities, and the English cities characterize England's occupations as industrial and commercial to a degree that is quite unique, as this contrast to her only trade rivals shows.

Modern civilized life is really based on the tilling of the soil. The activities of those who till the soil demand and create certain centers in which live people mainly occupied in exchanging and elaborating the products of the country soil and providing tools and necessities for the country dwellers.

These centers may consist of a few houses and a store at a country crossroads, or they may be a village, a town, a city, a metropolis. Village and city workers are engaged in tasks that aid and prosper life in the country; and the plowing of country furrows, the reaping of country crops, the milking of country cows is of great importance to the city, is motivated much of the time by things that happen within the city. The city is the creature of the country and cannot live without it. The city dweller knows that only in the country can he buy his food. He is not so well aware that without the country he would have no money to buy it with. Such is a normal relation of a city to the countryside about. The English cities are unique in that they have taken the whole world for their countryside.

On the coalfield of the Scottish Lowlands stands Glasgow, the greatest ship-manufacturing city in the world. The Newcastle coalfield has on it Newcastle, South Shields, and Sunderland. In the Midlands fields of Lancashire, Yorkshire, and the Black Country are twenty great cities within a sixty-mile radius.[2] The South Wales field sustains Swansea, Cardiff, as well as the municipalized Rhondda valley. The blank spaces between these city groups and the seacoast are the most striking feature of the map. In all these cities coal drives the wheels of industry to a degree far beyond any local or English needs. They are not merely centers that respond to the manufacturing, assorting, and exchanging needs of their countrysides, but they stand each on a coalfield that supplies power and they use it to produce goods destined to go forth on the ocean to find such market as they may. They are manufacturing towns only. It is thus that manufacturing has become the mainspring of England as of no other country. It is customary to say that "England has not room enough to raise all the products necessary to feed and clothe the people and make them comfortable." This is a misconception of the life of a manufacturing nation. England does not resort to manufacturing because she has not room enough to raise crops to feed and clothe her people. She was doing both adequately in the middle of the eighteenth century; she took to manufacturing because it was more profitable and quickly found it cheaper to buy raw productions in new countries than to raise them at home. The wealth that came to her from marketing her wares and from owning ships made it easy for her to buy food wherever she found it. Probably there is no place in the world so well stocked with the products of all the nooks and corners of the earth as London. But this condition was not studied out or planned by the English. The English people liked factory work better than farm work, just as Americans and Germans have come to do. In the twenty years preceding 1913 the cultivated area under the principal crops in the United Kingdom had diminished by 9 per cent, while in the United States it had

[2] They may be easily picked out on Figure 2 by their initials. Named in order from left to right and from top to bottom for each of these three regions, they are: Preston, Blackburn, Burnley, Bolton, Oldham, Liverpool (with Birkenhead), Manchester, Stockport, Stoke-on-Trent, Bradford, Leeds, Halifax, Huddersfield, Sheffield, Derby, Nottingham; Birmingham, Coventry, Leicester.

increased by 47 per cent. England has steadily abandoned tillage of her own lands as she found it easier to get crops from across the sea in exchange for her manufactures. The great parks of untilled English land attest the wealth of a nation that can hire its farm labor done cheaply in other countries.

London stands between the busy coalfields and the markets of the European mainland, the world's greatest manufacturing and commercial city, a city that has made the whole world its countryside. No wonder a fourth part of the world is the British Empire!

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Opening of the Lecture Season. The lecture program of the Society will open at eight-thirty o'clock on November 20 with an address by Mr. Donald B. MacMillan on the geographical work of the Crocker Land Expedition, of which he was leader. It will be recalled by readers of the *Geographical Review* that this expedition left for its base camp at Etah, Greenland, in 1913; that its main object was to explore Crocker Land; and that three relief expeditions in successive years were required to get the members safely home. The last relief ship, the *Neptune*, was commanded by Captain Robert A. Bartlett, to whose able seamanship is due the safe passage of the expedition through the extraordinary ice fields that marked the summer of 1917. The story of the expedition is of exceptional interest, for, though "Crocker Land" was found to be only a mirage, many valuable scientific results were secured by heroic perseverance in the face of great hardship.

Death of Mr. Henry Parish. Mr. Henry Parish died on September 18. Up to the time of his death he maintained an active interest in the Society, which dated from his election to Fellowship in 1872. He was a member of the Council for many years and was Chairman of it from 1895 to 1906, retiring only by reason of advanced years. He was consistent and broad in his care for the interests of the Society, supporting it with his means and by active personal effort. He was especially interested in the various Arctic expeditions to which the Society lent its sanction. During the period of his connection with the organization he saw it develop from a modest institution at 29th Street to its present extensive field of usefulness in its beautiful building at 156th Street, to the erection of which he contributed. His activities on behalf of the Society form only one of many works of public usefulness on his part which have stamped his memory as a worthy public-spirited citizen of New York.

Death of Councilor Charles Harrison Tweed. The Society is called upon to record with deep sorrow the death of its Councilor, Mr. Charles Harrison Tweed, who died on October 11. He had been for many years a Fellow of the Society and found time in the midst of an unusually active career to give counsel and help to the affairs of the American Geographical Society. His judgment was always accurate and his advice most valuable. His support of the active administration was constant and loyal. His associates and fellow Councilors share with a large circle of friends the sorrow occasioned by his decease.

NORTH AMERICA

Sign Posts in the Western Deserts. The gold rush of '49 involved the use of almost every available western trail. Men went by thousands into an untried wilderness, and through a heavy toll of life the worst desert places acquired a sinister fame. With better knowledge of the ground water and the location of springs, and with the building of railways, the dangers were diminished. This does not mean that the arid region of the West has been conquered. Much of it is still forbidding and some of it dangerous to cross. The desert still surprises the over-confident traveler.

The plan of erecting sign posts which will further diminish the dangers of desert travel is now actually under way. In 1916 Congress authorized the Department of the Interior to "develop, protect, and render more accessible for the benefit of the general public, springs, streams, and water holes on arid public lands of the United States; and in connection herewith to erect and maintain suitable and durable monuments and signboards at proper places and intervals along and near the accustomed lines of travel and over the general area of said desert lands, containing information and directions as to the location and nature of said springs, streams, and water holes, to the end that the same may be more readily traced and found by persons in search or need thereof; also to provide convenient and ready means, apparatus, and appliances by which water may

be brought to the earth's surface at said water holes for the use of such persons; also to prepare and distribute suitable maps, reports, and general information relating to said springs, streams, and water holes, and their specific location with reference to lines of travel." But, unfortunately, funds were not provided until 1917, when $10,000 was appropriated. The U. S. Geological Survey is in charge of the work, which is still in the preliminary stage.

From Mr. George W. Parsons, a Fellow of the Society, there has been received an interesting collection of photographs, clippings, and memoranda showing the progress that has been made in the desert sign-post movement, of which he is the author.

The Aboriginal Culture Areas of North America. Recent discussions and reports on the physiographic divisions of North America and especially of the United States have aroused a fresh interest in the bases of such classifications. Two papers appearing originally in the *American Anthropologist* and the *Journal of American Folk-Lore* and reprinted in a volume of similar studies (Anthropology in North America, G. E. Stechert & Co., New York, 1915) present subdivisions of the North American continent based on the culture and traits of its ancient inhabitants. These classifications reverse the process used by the geographer and take the resultants as the unit rather than the underlying causes. The first paper (Areas of American Culture Characterization Tentatively Outlined as an Aid in the Study of the Antiquities, by W. H. Holmes, pp. 42-75) divides North America into sixteen cultural areas, eleven excluding Mexico and Central America, viz.: (1) the North Atlantic area; (2) the Georgia-Florida area; (3) the Middle and Lower Mississippi Valley region; (4) the Upper Mississippi and Lakes region; (5) the Plains and Rocky Mountains; (6) the arid region [of the Southwest]; (7) the California area; (8) the Columbia-Fraser area; (9) the Northwest Coast area; (10) the Arctic coastal area; (11) the Great Northern-Central area. The classification by many museum directors of archeological material according to present political divisions has its analogy in geography in the use of the state or group of states as the unit of study. This policy has the same disadvantages in archeology as was found in geography, and the movement towards cultural regions in anthropology has the same necessity which hastened the wide adoption of regional geography. Holmes' divisions, tentatively suggested, are based on the clearly manifested phases of their culture content. It is recognized that the boundaries are at times not well defined, that cultures overlap and blend along easy lines of communication, and that the extension of knowledge may and probably will cause the shifting of the boundaries. The cultural divisions as illustrated on the map appended to the paper have certain agreements with some of the studies of physiographic provinces in North America (see W. L. G. Joerg: The Subdivision of North America into Natural Regions, *Annals Assoc. Amer. Geogrs.*, Vol. 4, 1914, pp. 55-83), and the conclusion is forced upon the archeologist that the relations of environment to man and culture must play an important part in the prosecution of his researches.

The second paper (Material Cultures of the North American Indians by Clark Wissler, pp. 76-134) follows somewhat the same lines of procedure as the preceding paper. Wissler's map shows but nine cultural areas north of Mexico, as follows: (1) the Eastern woodland area; (2) the Southeastern area; (3) the Plains area; (4) the Southwestern area; (5) the California area; (6) the Plateau area, (7) the North Pacific area; (8) the Mackenzie area; (9) the Arctic area. It thus essentially differs from Holmes' classification only in making two subdivisions east of the Great Plains where Holmes uses four. In describing the culture areas, Wissler states that each tends to have well within its borders a group of tribes whose cultures are quite free from the characteristic traits of other areas. As the spread of characteristic cultures is in this case also the basis of the cultural provinces, it is expectable that these should in the main be the larger geographical provinces. This paper enters into a greater detail of description than the preceding one and with many examples illustrates the theory of trait associations and the diffusion of material traits. In his conclusion, Wissler suggests that the significance of the geographical environment as a localizer, associator, or carrier of material traits or as a factor making for the continuity of a trait is a problem well worth considerable study. ROBERT M. BROWN.

The Potash Industry of the United States. In 1915 were made the beginnings of a domestic potash industry. In the first half of 1917, according to figures of the U. S. Geological Survey (*Press Bull. No. 535*, September, 1917), production had risen to 14,000 tons, valued at a sum approaching $6,000,000. The principal sources of this output were natural salts and brines and kelp, respectively accounting for about one-half and one-quarter of the total; alunite, dust from cement mills and blast furnaces, miscellaneous industrial wastes, and wood ashes contributed the remainder. The greatest single source, supplying one-third, was constituted by the Nebraska alkali lakes, described

in the *Review* for January (Vol. 3, 1917, pp. 67-68). Such a production is not inconsiderable for a new industry, but it still represents only about 10 per cent of the normal annual consumption prior to the war. For a further increase we are now encouraged to look to the much-talked-of deposit of Searles Lake (for a description of the "lake", by Hoyt S. Gale, see *U. S. Geol. Survey Bull. 580-L*, 1914). Development here has been held back pending legislation on the status of potash-bearing lands. On passage of the bill now before the Senate the product of the new Californian source may make its appearance in the market.

Extension of the Eastern Forest Reserves. In line with the policy to extend the National Forests, especially about the headwaters of navigable streams, the Government announces (*Official Bulletin*, June 26, 1917, p. 6) that 51,916 acres have been approved for purchase in the White Mountains and the Southern Appalachians. These tracts are an extension of the acquisitions already noted (*Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 875-876, and *Geogr. Rev.*, Vol. 2, 1916, pp. 223-224). The purchase was made possible by the appropriation of $3,000,000 voted by Congress on August 9, 1916, for the extension, during 1917 and 1918, of the forest reserves already formed under the Weeks Law. The total now acquired under the provisions of that law, including this last addition, amounts to 1,456,200 acres.

The Destructive Eruption of San Salvador Volcano on June 7, 1917. On June 7, for the third time within three-quarters of a century, the city of San Salvador was almost completely destroyed by earthquake shock. At the same time an outpouring of lava from the San Salvador volcano a few miles to the northwest laid waste much valuable coffee and maize land. Moreover, hot ashes carried by the wind over the mountain withered the beautiful plantations of the Santa Tecla Valley: "at least 35,000 quintals of coffee are lost, and probably 70,000 of sugar," writes a resident to the *Geographical Journal* (September, 1917). The volcanic and seismic phenomena are briefly described by Herbert J. Spinden of the American Museum of Natural History, who was present in San Salvador at the time (*Scientific American*, August 4, 1917). The first violent movement of the ground effected little damage in the capital city but caused heavy destruction in Quezaltepeque and other villages of the northern slope. Apparently this shock coincided with the opening of new vents on this side of the mountain. An hour or two later came the shock that ruined the capital. It is not improbable that the later movement represents a collapse of the crust following upon the withdrawal of lava from the interior. Prior to the eruption, slight tremors had been numerous for some days, and for several succeeding days shocks continued practically without cessation.

Earlier eruptions and other manifestations in this zone of active vulcanism are noted in a contemporary number of *La Nature* (No. 2287, July 28, 1917).

SOUTH AMERICA

The Geographical Results of Dr. Farabee's Explorations in the Amazon Basin. Published accounts are now available of Dr. Farabee's explorations in the Amazon Basin in 1913-1916 (W. C. Farabee: A Pioneer in Amazonia: The Narrative of a Journey from Manáos to Georgetown, *Bull. Geogr. Soc. of Philadelphia*, Vol. 15, 1917, pp. 57-103, with map, 1:1,200,000; *idem*, The Amazon Expedition of the University Museum, *Univ. of Pennsylvania Museum Journ.*, Vol. 7, 1916, pp. 210-244, Vol. 8, 1917, pp. 60-82 and 126-244). These make possible the presentation of the geographical results of the expedition in greater detail than in the note in the February *Review* (Vol. 3, 1917, p. 149).

In the course of the journey to the first of the four areas visited on the expedition, the Guiana highlands, the Rio Negro and its tributary, the Rio Branco, were followed, the grasslands and the southern forests of Guiana penetrated, and the Corentyn descended to its mouth. In the Guiana forests the expedition passed through territory beyond the limits of Schomburgk's explorations and among tribes to whom the white man was absolutely unknown. The Akarai Mountains, forming the divide between the Amazon and the Guiana streams and the accepted but undelimited boundary between southern British Guiana and Brazil, were crossed and recrossed and important observations made on the hydrography of the region. On the economic prospects of British Guiana Dr. Farabee says much of interest. The savannas of the interior plateaus are well suited for cattle raising. At present economic production is practically nil. Such cattle as are exported must find their way with the Brazilian beasts of the Rio Branco to Manáos:

there exists no road to the home market that otherwise could be found on the coast. Dr. Farabee endorses the opinion of every traveler in this part of the country—the need for a railroad to connect the interior with Georgetown. (Compare C. Clementi: A Journey to Mount Roraima across the Savannah Highlands of British Guiana, *Timehri*, Ser. 3, 1917, Vol. 4, and also the article on the same journey in the *Geogr. Journ.*, Vol. 48, 1916, and see the proposed interior railway shown on the official map of the colony, 1913). At Dada-nawa, the station occupied by the Government's Protector of the Indians, agriculture with irrigation was proving successful. The rainfall, approximating 60 inches per annum, falls almost entirely in June, but underground water is abundant, a steady east wind prevails, and "the windmill is all that is needed to make this a valuable agricultural region"—when communications are established. In the opinion of Dr. Farabee the upper basin of the Corentyn, now clothed with hardwood forest and apparently destitute of inhabitants, also offers a suitable field for colonization. Some day it will become valuable, and before this happens the sources of the Corentyn should be determined and the boundary with Dutch Guiana be delimited.

On his second journey Dr. Farabee proceeded up the Amazon to Iquitos and thence up the Ucayali to Cumaria, the head of launch navigation. Here no part of the terrain covered was new ground, but it provided a splendid field for the acquisition of ethnographical material, an important task in a region where the primitive life of the native is fast disappearing before the advance of civilization. Today on the larger streams of the rubber country the primitive is mingling with the modern in strange ways. On the Ucayali was seen "a dugout canoe fitted with an Evinrude gasoline motor and used by a Conebo Indian to bring rubber from the small rivers to the station."

The advent of the rainy season in southwestern Amazonia made practicable a journey up the Rio Purus to Senna Madureira, the capital of the Territory of Acre. Here rubber has been responsible for a rapid development. Since the Acre passed into Brazilian possession the capital of the district has appeared as a modern settlement, with tramcars and electric light, with streets and schools, and with houses well built of North American lumber. Of the various modern improvements the recent installation of wireless telegraphy is one of the greatest boons to the rubber collector, for by it he is kept in touch with market prices of rubber and is no longer at the mercy of the trader from Pará. Along the Purus the expedition's ethnological investigations were pursued with some difficulty. Even during the dry season comparatively few "wild" Indians are seen on the main stream, from which they have been driven by the rubber gatherer and his local destruction of game; during the wet season Indian encampments are only to be found some days' journey in the interior. To secure the data collected on four little-known Arawak-speaking tribes several side trips had to be made into the flooded forest.

The last journey of the expedition was made up the Tapajoz to visit the Mundurucus, the "head hunters," so named from their practice of preserving the heads of their enemies, a custom also in vogue among the Jivaros and other Amazonian tribes. The area occupied by the Mundurucus, who were formerly found on the banks of the main river, is now diminished: they have retreated to the semi-desert interior west of the divide between the Tapajoz and the Xingú. Another interesting tribe surviving in the Tapajoz basin is the Apiacas. To many native tribes along the navigable waterways Amazonian transportation owes a great and unrecognized debt. The Apiacas have such a claim on Matto Grosso. During the Paraguayan war, when the southern route via the Paraguay river was closed to western Brazil, a northern road was opened via the Tapajoz, and on it the Apiacas were employed as cargo-men. Today a good deal of fine rubber is carried down the Tapajoz and here, as on other Amazonian streams, the expert native paddle is effectively supplemented with motive power. "The journey to Matto Grosso, which requires from four to six weeks in a loaded canoe with paddles, can be made in twelve days by the aid of a motor."

EUROPE

A Forecast of Coming Winters in Western Europe. Mr. C. Easton in a letter to *Nature* (August 30, 1917, pp. 524-525) calls attention to some of the results of his extensive statistical study of winter temperatures in western Europe. After showing the close correspondence of the Paris and Utrecht temperature observations with the historical data for the past 89 years, he carries his investigation of winter temperatures back to the year A. D. 759. In these 1,157 winters there is a periodicity of 45 and 89 years, which in some respects is quite striking. Dividing the 1,157 winters into thirteen

89-year periods and then totaling the cold and severe winters for each quarter of the periods, the following results were obtained: first quarter, 30 cold and 12 severe winters; second quarter, 22 cold and 7 severe winters; third quarter, 31 cold and 15 severe winters; fourth quarter, 11 cold and 2 severe winters. In other words, the chances are that only one of the last 22 winters in one of these 89-year periods will be very cold or severe; while three or four such winters may be expected in each of the first and third 22-year periods, and two in the second. "The chance that the last quarter of an 89-year period contains a smaller number of hard winters than the preceding and following 22-year intervals is 0.88." The author says: "So early as 1905 I pointed out that a series of warm winters might be expected in the following years, according to these statistics, and that the year 1917 marked the beginning of a new period of comparatively cold winters. Though it seems a matter of mere chance that exactly the winter of 1916-1917 turned out to be the first . . . . really cold winter since 1895 in western Europe; nevertheless a change in the weather type about this time is in perfect agreement with the forecast." The author considers these periods "undoubtedly related to similar fluctuations in the sun's activity" and says that increased activity of the solar surface corresponds in general to earlier and colder winters in western Europe. "The forecast for the period 1917-1938, derived from these statistics, indicates at least two very cold and one severe winter; the average winter temperature for these twenty-two years being generally below the 89-year mean." CHARLES F. BROOKS.

The Utilization of Imatra Fall, Finland, for Hydro-Electric Power. One of the few channels by which the Finnish Lake Plateau discharges its waters into the lowland below is the Vuoksen River. This river drains Lake Saima, one of the larger bodies of water at the southeastern margin of this lake-studded platform, into Lake Ladoga and thus descends from a level of 255 feet to one of only 16 feet above the sea. Where the river discharges over the moraine-covered lip of the granitic platform it forms the well-known rapids known as the Imatra Fall. The rapids themselves have a fall of about 65 feet in a distance of 1,060 feet, the river here narrowing abruptly from a width of 580 feet to 154 feet. Thus all elements for the development of a high degree of water power are here concentrated. Investigations made before the war as to the amount of electrical energy to be derived from this source had shown that sufficient power could be generated to meet all future requirements for lighting, street railways, and the electrification of railroads in southeastern Finland and the Petrograd district (Petrograd being only 93 miles in an air line from Imatra Fall). In addition the water power is available of various other rapids and falls along the course of the Vuoksen River. What the fate of various projects under way in 1914 will be after the war is over is hard to conjecture, but, as *Russia* (R. Martens & Co., New York) for August observes, there is every likelihood of an opening for foreign capital to assist in developing this highly important resource.

An Aërial Mail Service between Continental and Insular Italy. The establishment of aërial mail service between islands and their mainlands promises a peculiarly valuable aid to the facilitation of their problems of communication. In this country a service between Nantucket Island and New Bedford has been proposed (*Geogr. Rev.*, Vol. 2, 1916, p. 152) and is expected to be in operation shortly, but in this field we are forestalled by Italy. Already regular mail service exists between the mainland and the islands of Sicily and Sardinia (*Journ. Roy. Soc. of Arts*, August 3, 1917, p. 644). The one route connects Naples and Palermo and is covered in two and one-half hours. The other route connects Civitavecchia and Terranova-Pausania and the journey occupies an hour and forty minutes.

The inauguration of another aërial mail line in Italy is reported in the September number of *Flying* (Mario de Bernardi: The First Permanent Aero Mail Line, Vol. 6, 1917, pp. 684-685). This line connects Turin with Rome.

ASIA

A New Interpretation of the Indian Monsoon. Mr. B. C. Wallis, in an article entitled "The Monsoon" in two recent numbers of *Indian Education* (Longmans, Green & Co., London), holds that "the hypothesis which states that the southwest monsoon is due to the high summer temperature and low summer pressure over Central Asia must at present be regarded with suspended judgment, if not with considerable suspicion." Mr. Wallis bases his objections on alleged facts and a general state of mind. The facts are of four kinds. (1) "Along the west coast of the Deccan the wind

blows on-shore from the sea from the end of March onwards, yet the rains fall with conspicuous suddenness in June.'' The implication appears to be that we have a monsoon blowing on the Western Ghats from the southwest during April and May with no rain. This flatly contradicts what we have been taught hitherto. Herbertson (The Distribution of Rainfall over the Land, London, 1901) gives 2 inches of rain at the southern end of the Western Ghats as early as March, 4 inches in April, and 12 inches in May. Although 16 inches fall along the whole coast in June, Wallis' statement that the rains ''fall with conspicuous suddenness in June'' is not accurate. (2) ''Similarly in Burma and Assam the on-shore winds from the Bay [of Bengal] precede the coming of the rains by weeks.'' No dates are given, and we can only set Mr. Wallis' statement against that of the climatologists. We note that the hills of Assam have 2 inches of rain as early as February, from which time the rainfall increases to 16 inches in May, when Burma joins in suddenly with 12 inches, *just as if* the monsoon had begun in May, as we have been taught. (3) ''In the case of the Madras coast, the rains precede the trade winds in the north, and the winds last long after the rains have ceased, i. e. during January and February.'' The rainfall of the north Madras coast is given by Herbertson as 2 inches in May, increasing from that time onward till it is nearly 8 inches by the end of September, while a little back from the coast more than 8 inches fall. Beginning with October the rains are heavier along the coast referred to than just inland, and the northeast trades are stated by Herbertson to prevail. It is not true that the northeast trades precede the rains. As the northern Madras coast trends northeast-southwest, it parallels the northeast ''trades,'' and rains on that coast are hardly to be referred to them. But in southern Madras, where the coast runs north and south, November sees heavy rains with the northeast winds. The rains of northern Madras are referred by Mr. Wallis as well as other writers to cyclonic storms from the Bay of Bengal. So the period of these rains does not depend on the period of the northeast winds at all. (4) ''During July and August a strong wind sets from the southwest from the African side of the Arabian Sea on-shore on the coast of Sind. The monsoon as an on-shore wind is fiercest there, yet Sind is arid.'' A glance at Herbertson's map shows us Sind with 2 to 4 inches in July and in August, too, while all the other months have less than 1 inch there. Evidently the two months of ''fiercest monsoon'' are the only wet months Sind knows! But Sind is low and level, and it is not on low and level lands, especially when heated by a zenithal sun, that monsoon winds are supposed to yield their rainfall.

Mr. Wallis' state of mind appears to be a conviction that the monsoons, like other features of the weather at the bottom of the ''troposphere,'' are controlled by happenings in the ''stratosphere,'' 8 or 9 miles above. He admits that we do not know much about the stratosphere yet, but India is walled off from the rest of Asia by the Himalayas to the full depth of the troposphere.

But a most welcome note is Mr. Wallis' contention that too much generalizing from insufficient data is indulged in in customary teaching about climate. Simplicity is highly prized by all teachers and rightly, but nature is not simple but highly complex. Teachers should observe local climatic facts, he urges, especially the varied facts of rain and wind in different parts of India, and these facts will not fit in with a broad general scheme without much modification to local circumstances. It is hard at present to learn what the facts of the actual winds are in various parts of India. Blandford's ''Climates of India'' gives only generalities. You cannot learn from it even for Calcutta what winds prevail month by month and how often they are interrupted by other winds than the prevalent winds, nor what winds prevail when the rains are falling. Indeed facts about winds everywhere are difficult to ascertain, especially in connection with this important matter of rainfall. Our own Weather Bureau publishes nothing on this important matter. Prevalent winds are given but not the winds blowing during rain, which is for landsmen the main interest in the wind. At Salt Lake City the prevalent wind is published as southeast, but all the heavy rains quoted from recent local records fell while the wind was mainly in the northwest, i. e., across Great Salt Lake to the city and the Wasatch just beyond. Buffalo, Chicago, Detroit, and San Francisco all have their prevalent winds in the southwest, but it must not be assumed that their rains come with southwest winds.

We should get a clearer idea of the rainfall of India as well as of that of Florida, if the wind during rain were published, and it is to be hoped that Mr. Wallis' plea to the teachers of India will induce them to put on record what the official meteorologists have not usually published. MARK JEFFERSON.

India's Coal Supply. The war has forced India to depend upon her own supply of coal and has drawn attention anew to her large deposits. For the last ten years her output has been gradually increasing as a consequence of the extension of railroads and

the development of industries. War conditions have accelerated this increase. The manufacture of munitions and the difficulty of securing coal from outside sources brought her production in 1915 up to more than 17,000,000 tons, a million tons more than in 1913 and more than double the amount she produced in 1905. She now not only supplies her own needs but exports to Ceylon and the Straits Settlements. India's coal deposits are scattered well over the east-central part of the country. In Assam, where the collieries at Margherita and on the Namchik River are working, there is a large field whose reserve is calculated at several billion tons. All these are Mesozoic and Tertiary beds. In Bengal and the recently created province of Bihar and Orissa are found the deposits that, at present, yield the greatest amount—over ninety per cent of the entire output. The best producing fields here are those of Raniganj and Jherria, the former in 1915 yielding 5,485,000 tons, the latter 9,141,000. Both of these fields contain large reserves, that of the former being estimated at 22,000,000,000, of which 518,000,000 are first-class coal. The Jherria field falls little behind these figures. The Giridih field, lying not far to the north, is not so well explored but has very large deposits.

In Central India and the Central Provinces few mines are actually being worked, but large quantities of good coal have been recognized, while in the Godavari basin, extending from near the coast along the Godavari River, important reserves are believed to be probable.

As the coal measures of Bengal and the province of Bihar and Orissa also contain clay ironstones and lie, generally, in territory that can be easily reached from the coast or are near important centers of industry, their value to India will probably increase very greatly as her industrial life develops.

Up to the present time the labor supply for the mines has been derived largely from the agricultural population. The farmers from the mountainous country of Chota Nagpur and the Central Provinces till their lands and reap their harvests still but migrate to the coal regions between times, somewhat as the Chilean laborers go north to the nitrate fields in winter and back to the farms of Central Chile in the summer season. This is a rather unsatisfactory supply for mining labor. It will probably change, and coal mining will become the regular occupation of a population at the coalfields.

The *Journal of the Royal Society of Arts* for June 22, 1917, quoting from the *Pioneer Mail*, summarizes the "Report on the Production of Coal in India" recently issued by the Department of Statistics. A description of the coalfields of India may be found, too, in "The Coal Resources of the World" prepared for the Twelfth International Geological Congress, Canada, 1913, while a more detailed account of the various fields is contained in a treatise on the "Coal Fields of India" by R. R. Simpson in Vol. 41, Part I, of the *Memoirs of the Geological Survey of India*, Calcutta, 1913.

Aden, the Emporium of Southwestern Arabia. The British district of Aden has become, in recent years, a distributing center for merchandise between Bombay and Suez, as well as from the Persian Gulf and Arabian and East African ports. At Aden the trader from Mombasa or Madagascar rubs elbows with Malabar Hindus, Bushire Persians, and desert Arabs. Although the war has interfered with the business of this trade center, its commercial exchanges with foreign parts are on the increase. Trade between Aden and America is growing and promises to become important. This lends interest to a recent report on the district by Consul Addison E. Southard published as *Supplement No. 49a to Commerce Reports* for May 7, 1917.

The local consumption of goods is insignificant. But as a center through which important markets can be reached, Aden is very advantageously situated. Its harbor is wide and commodious, being four by eight miles in area and providing anchorage for steamers drawing as much as 32 feet. The cargoes discharged at Aden are distributed over a large part of southern Arabia between the Red Sea and the Persian Gulf. They find their way to the Italian colony of Eritrea, to Abyssinia and the French colony of Jibuti, and to Somaliland. From all these centers a large quantity of merchandise is sent in return to Aden. Through Jibuti come cargoes of Abyssinian hides and coffee. The products of the Yemen and Hadramut rearlands are borne on camels, pack caravans reaching Aden daily. Thus a wide area of southwestern Asia and northeastern Africa is dominated commercially by Aden. In addition the district is a coaling station of prime importance and an advanced outpost of the Indian Empire.

HUMAN GEOGRAPHY

Graphic Representation of the Effect of Climate on Man. The admirable work of Dr. Griffith Taylor upon the climate and crops of Australia has already been reviewed

in the *Geographical Review* (Vol. 1, 1916, p. 396). He has now published a still more interesting paper on "The Control of Settlement by Humidity and Temperature" (*Commonwealth Bur. of Meteorol. Bull. No. 14*, Melbourne, 1914). Although the paper applies primarily to Australia it touches upon all parts of the British Empire and upon many other countries. Dr. Taylor's purpose is to discover whether there is ground for the hope that Australia may ever become a genuine white man's country, that is, a country *densely settled* by members of the white race. In pursuit of this object he first gives us some excellent maps showing the mean range of temperature in Australia between the hottest and coldest months and the mean humidity of the continent for each month. He then proceeds to develop what he has called the "climograph." Like many other recent students he is convinced that humidity is as important as temperature. If a climate is to be represented by only a single set of monthly numbers, the wet-bulb, or "sensible," temperature comes nearer than anything else to showing how man is affected. Accordingly he selects humidity and wet-bulb temperature as the two chief climatic criteria and draws a series of figures one of which (Fig. 9, opp. p. 20) is here reproduced.

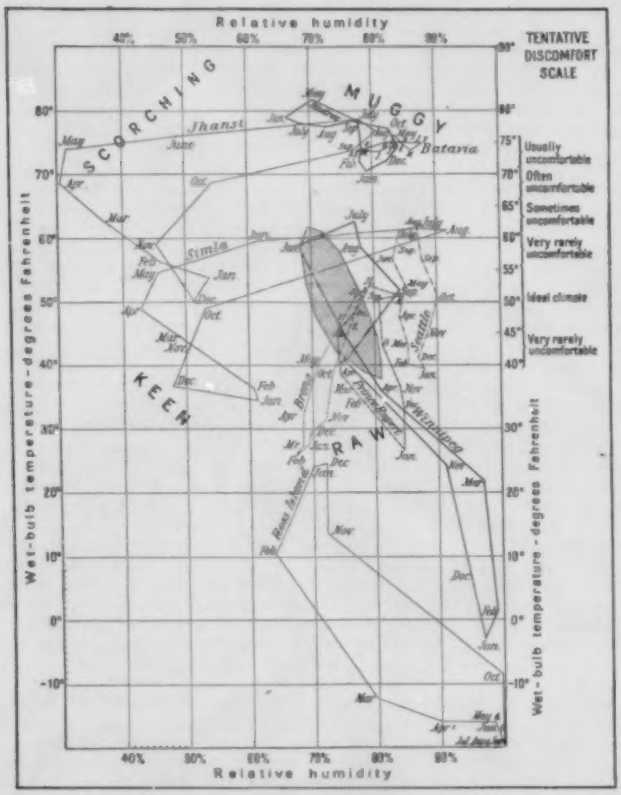

FIG. 1—A "climograph" of nine different places, affording a criterion as to the effect of their climates on man. The places are: Batavia, Java; Madras, Jhansi, Simla, India; Seattle, Wash.; Brönö, Norway (65½° N.); Prince Rupert, B. C.; Winnipeg, Man.; Ross Island, Antarctic (78° S.). (Redrawn from Fig. 9 of Griffith Taylor's "The Control of Settlement by Humidity and Temperature.")

A "climograph" is a graph in which the twelve monthly mean values of wet-bulb temperatures and relative humidity at a given place are plotted as a twelve-sided polygon. The shaded polygon is a composite climograph and represents ideal conditions for the white race.

His method is unique and so valuable that it ought to be widely understood. The ordinates of the diagram represent relative humidity, and the abscissas the wet-bulb temperature. On the basis of these two criteria a point on the chart is located for a given place for each month. Then the months are connected in their proper order, thus giving a closed figure whose lines may or may not cross. Four extremes are possible, as is indicated by the words "scorching," "muggy," "raw," and "keen" in the corners of the diagram. In order to find the ideal conditions as nearly as possible, Dr. Taylor chooses twelve large cities in regions where the white man prospers. Five of these are in the southern hemisphere, namely, Sydney, Perth, Hobart, Capetown, and

Johannesburg, and seven are in the northern hemisphere, namely, London, Aberdeen, Berlin, Toronto, New York, Chicago, and Seattle. From the average monthly figures for these twelve he prepares a "composite white climograph," which is shown by the shaded area in the diagram. He assumes that the conditions thus represented are close to the ideal. New Zealand, England, and the Puget Sound region come nearest to this ideal. This result agrees closely with the conclusions of the reviewer, based on a wholly different method, a fact which Taylor brings out forcibly.

While the general value of Taylor's method cannot be doubted, one special point leaves room for question. By using the wet-bulb temperature and the relative humidity he seems to have given double weight to humidity. The wet-bulb temperature is in itself an expression of the amount of moisture in the air. Its chief value consists in the fact that it enables one to describe the effect of a climate by means of a single set of figures or a single curve. If two sets of figures are used and diagrams are drawn in two dimensions the actual temperature and the humidity would seem to be the ones that should be chosen. The use of this method is illustrated by W. D. Pierce in his paper on the boll weevil (A New Interpretation of the Relationships of Temperature and Humidity to Insect Development, *Journ. Agric. Research*, Vol. 5, 1916, pp. 1183-1191). His diagram is here reproduced. By a long series of experiments Pierce determined the death-rate of the weevils under various conditions of humidity and temperature. He was thus able to locate a central or optimum area where the insects thrive vigorously. Around this area he was also able to draw concentric lines showing the degree to which the weevils are weakened, and the conditions under which they become dormant and finally die. He suggests that a similar diagram might well be drawn for man. As visual representations of the various effects of climate, however, Taylor's diagrams are much the best yet available.

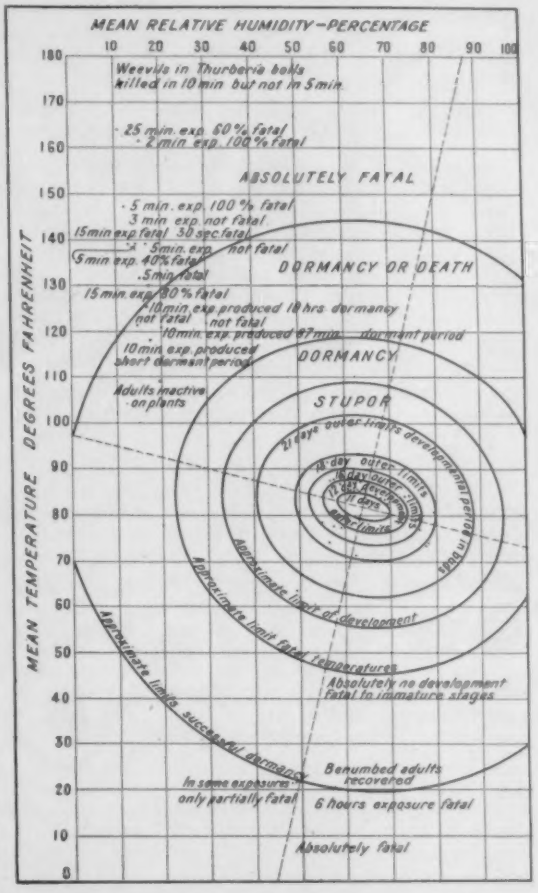
MEAN RELATIVE HUMIDITY—PERCENTAGE
10 20 30 40 50 60 70 80 90 100
MEAN TEMPERATURE DEGREES FAHRENHEIT
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
Weevils in Thurberia bolls killed in 10 min. but not in 5 min.
25 min. exp. 60% fatal
2 min. exp. 100% fatal
ABSOLUTELY FATAL
5 min. exp. 100% fatal
3 min. exp. not fatal
15 min exp. fatal 30 sec. fatal
5 min. exp. not fatal
5 min exp. 40% fatal
5 min. fatal
DORMANCY OR DEATH
15 min. exp. 30% fatal
10 min. exp. produced 10 hrs. dormancy
not fatal not fatal
10 min. exp. produced 97 min. dormant period
10 min. exp. produced short dormant period
DORMANCY
Adults inactive on plants
STUPOR
21 days outer limits development period
18 day outer limits
14 day outer limits
10 days
7 days
3 days
Approximate limit of development
Approximate limit Fatal Temperatures
Absolutely no development fatal to immature stages
Approximate limits successful dormancy
Benumbed adults recovered
In some exposures only partially fatal
6 hours exposure fatal
Absolutely fatal

FIG. 2—Graph showing the relations of temperature and humidity to cotton boll-weevil activity. (Redrawn from Fig. 1 of the paper by W. D. Pierce mentioned in the text.)

ELLSWORTH HUNTINGTON.

GEOGRAPHICAL NEWS

Free Geographical Material. The May, 1917, number of the *Journal of Geography* is devoted to the useful object of presenting a fairly complete list of geographical publications that may be obtained free or at small cost. There is an introductory discussion

followed by a general list arranged in alphabetical order by countries. This is followed by a list of references on industries and commercial products, a miscellaneous list, a compilation of educational exhibits, and a list of addresses of dealers in geographical supplies. The whole number is one which every teacher of geography should have at hand and is especially valuable for the isolated school where appropriations for supplies are exceedingly limited. The above list is taken from a more complete list of geographical material published by the Eastern Illinois Normal School, Charleston, Ill., and sent free of charge to those applying to the school for it.

Personal

Professor W. M. Davis of Harvard University read a paper on April 14 before the American Philosophical Society of Philadelphia on "Uplifted and Dissected Atolls in Fiji."

Dr. W. C. Farabee of the University of Pennsylvania, whose recent explorations in South America have been the subject of a lecture before the Society and of several notes in this *Review*, read a paper before the American Philosophical Society of Philadelphia on April 14 entitled "The South American Indian in His Relation to Geographic Environment."

Major-General George W. Goethals read a paper before the American Philosophical Society of Philadelphia on April 14 on "The Slides on the Panama Canal."

Dr. J. Paul Goode of the department of geography of the University of Chicago has been promoted from an associate professorship to a professorship in the department.

Mr. Harvey D. Goulder, General Consul for the Lake Carriers Association, addressed the American Association of Port Authorities at Cleveland, Ohio, on September 11, on "Water-borne Traffic on the Great Lakes."

Dr. Ellsworth Huntington gave a lecture before the Geographic Society of Chicago on October 26 entitled "The Turks and the Euphrates."

Mr. Robert B. Marshall of the U. S. Geological Survey, as a major in the Engineer Officers' Reserve Corps, is at present engaged in military mapping for the War Department.

Dr. Fridtjof Nansen, who has been in this country since July 26 as Minister Plenipotentiary of Norway on Special Mission, addressed the Food Conference held on September 14-15 in Philadelphia at the American Academy of Political and Social Science.

Dr. H. F. Reid of Johns Hopkins University read a paper on "The Distribution of Land and Water on the Earth" before the American Philosophical Society of Philadelphia on April 14.

Professor Bernard H. Schockel of the department of geography and geology in the Indiana State Normal School has taken a leave of absence to complete his course of study in Chicago University. His work at Terre Haute will be carried on by Dr. Charles R. Dryer, whom he succeeded in 1913.

Dr. W. S. Tower of the department of geography of the University of Chicago has been promoted from an associate professorship to a professorship in the department.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

UNITED STATES

Western States

LA RUE, E. C. **Colorado River and its utilization.** 231 pages; maps, diagrs., ills., bibliogr., index. *U. S. Geol. Survey Water-Supply Paper 395*, Washington, D. C., 1916.

For some years the U. S. Geological Survey has been publishing in great detail the results of its hydrographic studies of the various river systems of the country. Nine-tenths of these publications have been technical or statistical in character and present little variation in the mode of treatment. In this paper we have a notable departure from the general scheme with the commendable result that the geographer finds in well-classified and readable form data of first importance in a study of the Colorado River. The report opens with an account of the physical features abstracted from Powell's "Canyons of the Colorado," published in 1895. Under "Explorations" are outlined and arranged in chronological order the various expeditions in and about the canyon from 1531 to 1911, with a condensed account of each.

A section on population gives the number of persons in the Colorado River basin in 1915 and the population of important cities. Some interesting comparisons between the Nile and the Colorado—area, length, total fall, irrigable land, mean annual run-off, and principal crops—increase the geographical value of the report. A useful bibliography of United States Government papers is included and will be appreciated by those attempting to master the growing literature on the Grand Canyon region. Instead of the cut-and-dried descriptions of the main stream and its tributaries usually found in reports of a similar nature we have a geographical description of considerable merit. Irrigation from the Colorado River is discussed in other sections, of which the most important is that dealing with the Imperial Valley project. Plate 14 and the accompanying text show an interesting diversion from the Green River basin to the Colorado basin. Of special interest is the section devoted to the adequacy of water supply for lands on the lower Colorado. It is estimated that the irrigable area below the Virgin River aggregates 2,730,000 acres. There are sections on the water-power developments, the magnitude and frequency of floods, and the amount of silt in the Colorado River. The maps are noteworthy. Plate 12, on the scale of 1:250,000, shows the drainage diversions for irrigation in the Imperial Valley and is the best large-scale map now in existence of the region between the mouth of the Colorado and the Salton Sea. Plate 20 shows the volume of discharge of the Colorado River and its tributaries by the device of a colored band increasing in width down stream, the width of the tint being proportional to the volume of discharge. Plate 13 shows reservoir and water-power sites, both developed and undeveloped, up to 1915 and also indicates the points of diversion from the Colorado drainage basin to neighboring basins. Plate 15 represents constructed and proposed diversions from the Colorado River basin to the Mississippi River basin.

If the U. S. Geological Survey could make similar studies of the other great river basins within our domain it would render an exceedingly important public service. There is in La Rue's report a quality missing from many of the other *Water-Supply Papers* and strongly reminiscent of Powell's "Arid Lands of the West" and Johnson's "High Plains and Their Utilization." *Water-Supply Paper 395* should become well known among geographical scholars.

TRIMBLE, W. J. **The mining advance into the Inland Empire: A comparative study of the beginnings of the mining industry in Idaho and Montana, eastern Washington and Oregon, and the southern interior of British Columbia, and of institutions and laws based upon that industry.** Map, bibliogr. *Bull. Univ. of Wisconsin No. 638* (*History Series*, Vol. 3, 1914, No. 2, pp. 137-392). Madison.

"The plan of presentation contemplates: (1) a survey of the history of the mining advance; (2) special treatment of its social and economic aspects; (3) consideration of

problems of government." The struggle with the Indians of the Northwest, the hardships suffered on account of the remoteness of the territory from permanent habitations, the consequent lack of an established social régime, the assortment of peoples representing almost every part of the earth's surface and possessed of a wide variety of experiences and inclinations—these were the great problems to be overcome by the pioneers of the "Inland Empire."

Emphasis is placed upon the fundamental fact that co-operation is essential to successful gold mining. The process of placer-mining, the method most commonly used in the early days, is described in some detail. The food supply was a cause of no little concern. Meat was apparently plentiful, but plant food was lacking. Hence agriculture was given early consideration. This in turn raised the question of how best to distribute the lands for farming. The details of that situation are presented briefly, with stress on the conditions in British Columbia. The influence of the large gold production in the Northwest during the Civil War, a time when the nation was hard pressed for money, is shown to have been momentous. The establishment of transportation routes to the east is described in a single chapter.

Returning, in a later chapter, to the people, under the caption "Components and Characteristics of Society," the author shows how large a rôle "enterprise" played as one of their most prominent characteristics. Nomadism among the miners was prevalent. Despite that fact, semi-permanent and permanent communities took root in many places.

Two chapters on "Law and Government" and a selected bibliography conclude the volume. It is to be regretted that so excellent a piece of work should be introduced with so poor a map. EUGENE VAN CLEEF.

BENSON, H. K. **Industrial resources of Washington.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 9, pp. 353-356.

BERRY, SWIFT. **Lumbering in the sugar and yellow pine region of California.** 99 pp.; map, ills. *U. S. Dept. of Agric. Bull. No. 440.* Washington, D. C., 1917.

BRETZ, J H. **The Satsop formation of Oregon and Washington.** Map, diagr. *Journ. of Geol.*, Vol. 25, 1917, No. 5, pp. 446-458. [Outlines the position and topographic (as well as stratigraphic) relations of the widely distributed Satsop formation and concludes that these indicate a Quaternary age for at least a considerable portion of the Cascade Range.]

BUCHANAN, J. E. **The Spokane country; Its industries and cities.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 9, pp. 356-361.

BURKE, EDMUND, AND R. M. PINCKNEY. **Temperature records, 1898-1913: An appendix to report on Montana climate.** *Montana Agric. College Exper. Sta. Bull. No. 99*, pp. 68-143. Bozeman, 1914.

BUTLER, G. M., AND G. J. MITCHELL. **Preliminary survey of the geology and mineral resources of Curry County, Oregon.** Maps, diagrs., ills., index. *Mineral Resources of Oregon*, Vol. 2, 1916, No. 2, pp. 1-134. Oregon Bureau of Mines and Geology, Corvallis.

BUWALDA, J. P. **Meteorological synopsis of Berkeley, (1) August, (2) September, (3) October, 1916. (Second Ser., Vol. 5, Nos. 2, 3, 4.)** 2 pp. each. Dept. of Geogr., Univ. of California, Berkeley.

CHAPMAN, C. E. **The Alta California supply ships, 1773-76.** *Southwestern Hist. Quart.*, Vol. 19, 1915, No. 2, pp. 184-194.

CHAPMAN, H. H. **The extension of National Forests in Colorado.** Ills. *Amer. Forestry*, No. 283, Vol. 23, 1917, pp. 399-402.

CHITTENDEN, H. M. **A 30-mile railway tunnel under the Cascade mountains.** Maps, diagrs., ills. *Engineering News*, Vol. 76, 1916, Nov. 16, No. 20, pp. 928-935. [Abstracted in the January *Review*, p. 67.]

CLARK, W. O. **Ground water for irrigation in the Morgan Hill area, California.** Maps, diagrs. *U. S. Geol. Survey Water-Supply Paper 400—E*, pp. 61-105. Washington, D. C., 1917.

COCKERELL, T. D. A. **Colorado a million years ago.** Ills. *Amer. Museum Journ.*, Vol. 16, 1916, No. 7, pp. 443-450.

—— **Conquest of the desert, The.** Ills. *Dun's Rev.: Internatl. Edit.*, Vol. 27, 1916, No. 6, pp. 39-41.

COOPER, W. S. **Redwoods, rainfall, and fog.** Map, ill. *Plant World*, Vol. 20, 1917, No. 6, pp. 179-189.

CRANDALL, L. D. **The "Colonel Wright."** *Washington Hist. Quart.*, Vol. 7, 1916, No. 2, pp. 126-132. [The first steamship navigating the Columbia River, 1859.]

WEAVER, C. E. **Mineral resources of Washington.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 9, pp. 343-347.

YOUNG, R. F. **Relation of precipitation to stream flow in northern Rockies and incidental effects of temperature and evaporation.** *Reclamation Record*, Vol. 6, 1915, No. 6, pp. 266-267. U. S. Reclamation Service, Washington, D. C.

—— [*Colorado*]: ***Map showing the location of the Animas Power and Water Co.'s hydraulic developments, transmission lines, distributing circuits, etc.*** 1 in. to 2 mi. (1:126,720). C. P. Gray, New York, 1916.

—— ***Coquille River, Oregon, entrance.*** 1:10,000. *U. S. Coast and Geodetic Survey Chart No. 5971.* Washington, D. C., 1916.

—— [***Topographic map of the United States.***] Sheets: (1) ***Copperopolis***, (2) ***Santa Rosa, California.*** 1:62,500. U. S. Geol. Survey, Washington, D. C., 1916.

MEXICO AND CENTRAL AMERICA

WEBSTER, E. B. **Report on the northern district of Lower California; with special reference to the climate, water supply, and agricultural production, present and prospective, of the La Frontera subdivision of the northern district, and the mineral resources of the whole of the northern district, extended comparisons being made between the northern district, and especially between the La Frontera subdivision of the northern district, and southern California in the United States.** xxiii and 359 pp.; 12 maps in separate roll. Fry & Smith, San Diego, 1913. 9 x 6.

A curious and naive book. Probably also in some respects a useful book. Large portions of it consist of quotations from a lengthy "Report on Southern California"—not yet published. The endless references to this report—often three or four on a double page—remind one of the repetitions of the lama formula of Tibet *Om mani padme hum!* Questions are raised only to be dropped—as if an orator, after much gesticulation, sat down without beginning his speech. "It may be mentioned in passing that since the above quotation from the writer's report....was written, the question has arisen at the suggestion of the writer as to whether...." (page 191) is the preamble to the question whether the removal of the chaparral covering affects the run-off. "The movements of the permanent highs and lows bring rain to the Coast Region...." leaves one bewildered. When does a "high" bring rain? What information is conveyed by the phrase "...deductions made by the writer from personal examinations of the areas involved"? Doubtless a great many of the data, which include statistics about crops, irrigated land, farm values, and rainfall, are reliable; but in the nearly complete absence of reference to authoritative sources it is not possible to separate the accurate from the inaccurate.

Accompanying the report, though as a separate publication, are a set of maps, chiefly blue prints, showing the physical regions, the arable areas, river systems, and mineral deposits of the northern district of Lower California. They contain a large number of place names, and relief is shown roughly by hachures.

—— **Beginning of work on the Honduran section of the Pan American railway.** *Bull. Pan American Union*, Vol. 42, 1916, No. 3, pp. 317-318.

—— **Catálogos de los movimientos registrados durante el año de 1911 en las Estaciones Seismológicas de Mérida, Yucatán, Mazatlán, Sinaloa, y Oaxaca. Catálogo de los macroseismos sentidos en la República Mexicana durante el año de 1911.** *Parergones del Inst. Geol. de Mexico*, Vol. 5, 1913, No. 1-3, pp. 1-79.

DAGGETT, STUART. **The Panama Canal and transcontinental railroad rates.** *Journ. of Polit. Econ.*, Vol. 23, 1915, No. 10, pp. 953-960. Univ. of Chicago, Chicago, Ill.

DOMINIAN, LEON. **Glimpses of the Mexican's geographical background.** Ills. *Bull. Geogr. Soc. of Philadelphia*, Vol. 14, 1916, No. 3, pp. 81-91.

FRANCK, H. A. **Tramping through Mexico, Guatemala, and Honduras: Being the random notes of an incurable vagabond.** 378 pp.; map, ills. The Century Co., New York, 1916. $2.00.

GALVEZ, VICENTE. **Las aguas subterráneas en los municipios de Acatlán y Jaltepec, distrito de Tulancingo, Estado de Hidalgo.** Map, ills. *Parergones del Inst. Geol. de Mexico*, Vol. 5, 1916, No. 10, pp. 429-475.

GILLPATRICK, WALLACE. **The man who likes Mexico.** xvi and 374 pp.; ills. The Century Co., New York, 1912. 8½ x 6.

HAGAR, G. J. **Plain facts about Mexico: The country, states and cities, the people, the resources, government, and statistics.** 80 pp.; map, index. Harper & Brothers, New York and London, 1916. 50 cents. 8 x 5.

LEDUC, ALBERTO, LUIS LARA Y PARDO, AND CARLOS ROUMAGNAC. **Diccionario de geografía, historia y biografía mexicanas.** viii and 1109 pp. Vda de Bouret, Paris and Mexico, 1910. 7 x 5.

—— **Nicaragua, Trade of, in 1915.** *Board of Trade Journ.*, No. 1,028, Vol. 94, 1916, pp. 416-418. London.

ORDOÑEZ, EZEQUIEL. **A short note on the oil fields of Mexico.** *Mem. y Rev. de la Soc. Científica "Antonio Alzate,"* Vol. 34, 1916, No. 4-9, pp. 121-127.

REID, H. F. **Note on the earthquakes at Almirante, Republic of Panama, in April, 1916.** *Bull. Seismological Soc. of America*, Vol. 7, 1917, No. 1, pp. 27-30.

REID, W. A. **Merida and Progreso: Yucatan's busy cities.** Ills. *Bull. Pan American Union*, Vol. 44, 1917, No. 2, pp. 161-173.

—— **Salvador, El, Anuario estadístico de la Republica de correspondiente á 1914.** 159 pp.; ills. Dirección General de Estadística, San Salvador, 1915.

SANDBERG, H. O. **Central America of to-day—El Salvador.** Ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 3, pp. 340-357.

SANDBERG, H. O. **Central America of to-day—Nicaragua.** Ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 4, pp. 480-496.

SANDBERG, H. O. **Panama—to-day and to-morrow.** Ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 6, pp. 745-762.

TRISTAN, J. F. **The Costa Rica earthquake of February 27, 1916.** *Bull. Seismological Soc. of America*, Vol. 6, 1916, No. 4, pp. 232-235.

YOUNGBLOOD, F. J. **A little journey in Honduras.** Ills. *Natl. Geogr. Mag.*, Vol. 30, 1916, No. 2, pp. 177-184.

WEST INDIES

WESTERGAARD, WALDEMAR. **The Danish West Indies under Company rule (1671-1754), with a supplementary chapter, 1755-1917.** With an introduction by H. M. Stephens. xxiv and 359 pp.; maps, ills., bibliogr., index. The Macmillan Co., New York, 1917. $2.50. 8½ x 6.

This study is the result of an exhaustive research into the material of the Danish state archives and other original sources. In the introduction by Professor Stephens the geographic interest is anticipated. During the seventeenth and eighteenth centuries the West Indies, small islands of easily detached ownership, were a focus of political and economic interest for the nations of Europe. It may be recalled that the little French island of Guadeloupe was actually balanced against Canada in the negotiations at the conclusion of the Seven Years' War! The all-important motive was the sugar trade: "the European nation that could grow its own sugar cane and import its own sugar in its own ships had an immense commercial advantage over other countries." Dr. Westergaard's book may be looked upon as a history of the earlier days of sugar production in the Danish islands. A considerable part of it is devoted directly to this theme: the plantations are described, the life on them and the labor question, that great problem that confronted all the tropical colonies of America. Here geographic influences are revealed: witness such paragraphs as these on the planter's troubles with his slaves: "The chief means of communication between the more remote and inaccessible plantations and the harbor on the south side was by canoe. The mountainous character of the island and the torrential downpours to which it was subject rendered the making and repairing of roads a costly matter; but the numerous 'bays' with their convenient beaches lent themselves to the keeping of canoes and small sailboats . . . . When the slave-hunt in the bush became too successful, it is not strange that the hunted negroes, who were often proficient in handling the canoes, should take to the boats and pull for Porto Rico . . , a promised land from which rarely indeed was a slave returned" (p. 160); and "The uprising of the slaves on St. John began late in November, 1733. During the spring and summer preceding there had been a long period of drought, followed in July by a destructive hurricane which had inflicted considerable damage upon the already suffering crops as well as upon buildings and shipping. A plague of insects had destroyed many of the products of the islands, and the negroes were threatened with famine. Another storm in the early winter was especially severe on the maize crop, on which the negroes largely depended for food" (p. 166).

The history of any West Indian island, however local and intensive, is inevitably

wrapped up to a peculiar degree with events of wider scope. Dr. Westergaard brings such broad relations into clear focus in his treatment of the Danish islands. One episode is worth recording here because it is both timely and little known. This is the incident of Prussia's first attempt to enter the colonial field. Under the Great Elector, Brandenburg-Prussia, without sea-power, attempted to secure a share in the Indies through the great sea power Denmark-Norway and for a time enjoyed a station on the island of St. Thomas.

To the earlier stage in the history of the islands is added a short chapter on the history subsequent to 1755. With this later period the author proposes to deal in two succeeding volumes: they will be waited with interest.

—— **Agriculture, Report of the Director of, for the nine months ended on the 31st of December, 1915.** 54 pp.; diagr. Dept. of Agric., Trinidad and Tobago. Trinidad, 1916. [Includes rainfall statistics.]

—— **American Gibraltar, An: Notes on the Danish West Indies.** Maps, ills. *Natl. Geogr. Mag.*, Vol. 30, 1916, No. 1, pp. 89-96. [States that according to planimetric measurements made in the office of the National Geographic Society on hydrographic charts (scale not given) the areas of the three major islands in square miles are as follows: St. Thomas, 28.25; St. John, 19.97; St. Croix, 84.25.]

BRITTON, N. L. **The Danish West Indies.** Ills. *The South American*, Vol. 5, 1916, No. 1, p. 10. [Notes on the vegetation.]

BROCK, H. G., P. S. SMITH, AND W. A. TUCKER. **The Danish West Indies: Their resources and commercial importance.** 68 pp.; map, ills. *Bur. of Foreign and Domestic Commerce Special Agents Series No. 129.* Dept. of Commerce, Washington, D. C., 1917. [An authoritative official account of the resources and commercial possibilities of our newly acquired islands, on which several of the articles here listed are based.]

—— **Cuba.** 80 pp. Guaranty Trust Company of New York, 1916. 7 x 5. [One of a series of pamphlets on foreign trade issued by this company.]

—— **Cuban Number, Special.** Ills. *The South American*, Vol. 4, 1916, No. 10 (= pp. 239-290).

—— **Danish West Indies, The.** Map, ills. *Bull. Pan American Union*, Vol. 44, 1917, No. 2, pp. 189-200. [Spanish version in *Bol. Unión Panamericana*, Vol. 44, 1917, No. 3, pp. 350-361.]

—— **Danish West Indies, The—Their strategic and commercial importance.** Map, ills. *Dun's Rev.: Internatl. Edit.*, 1916, Sept., pp. 47-50.

DELGADO, R. M. **Results of American administration in Porto Rico.** Ills. *The South American*, Vol. 4, 1916, No. 4, pp. 77 and 90.

EMERSON, GUY. **The Virgin Islands of the United States: A description of the latest addition to Uncle Sam's vast dominion.** Ills. *The South American*, Vol. 5, 1917, No. 8, pp. 5-8.

FORD, J. C., AND FRANK CUNDALL. **The handbook of Jamaica for 1916: Comprising historical, statistical, and general information concerning the island, compiled from official and other reliable records, Vol. 36.** viii, 642, and xii pp.; maps, bibliogr., index. Government Printing Office, Kingston, and Edward Stanford, London, 1916. 6s. 9 x 6. [Includes a brief bibliography of Jamaica. A full bibliography, Bibliographica Jamaicensis, was published by the Institute of Jamaica in 1902 and a supplement of it in 1908.]

GOODRICH, C. F. **Our navy and the West Indian pirates: A documentary history.** Bibliogr. *U. S. Naval Inst. Proc.*, No. 164, Vol. 42, 1916, pp. 1171-1192.

GUTIÉRREZ-LANZA, P. M. **Apuntes históricos acerca del Observatorio del Colegio de Belén, Habana.** iv and 178 pp.; ills. Imprenta Avisador Comercial, Habana, 1904. 9½ x 6½.

GUTIÉRREZ LANZA, MARIANO. **Conferencias de seismología pronunciadas en la Academia de Ciencias de la Habana.** xvi and 157 pp.; maps, diagrs., ills. Imp. y Libreria de Lloredo y Ca., Habana, 1914. 10 x 7.

HALL, MAXWELL. **West Indian cyclones and the local wind.** Diagr. *Quart. Journ. Roy. Meteorol. Soc.*, No. 179, Vol. 42, 1916, pp. 183-189.

JACOBSEN, E. D. **Our new Caribbean Islands.** Map, ills. *Amer. Review of Reviews*, Vol. 55, 1917, No. 3, pp. 275-280.

—— **New colony of the United States, The, in the Caribbean.** Map, ills. *Dun's Rev.: Internatl. Edit.*, Vol. 28, 1917, No. 2, pp. 36-41 and 46; No. 3, pp. 45-47. [An account of the economic resources of the Virgin Islands, with good photographs.]

PAYNE, C. H. **Danish West Indies.** 4 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 37a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

SLOSSON, E. E. **Three Saints of the Caribbean: The Danish West Indies.** Ills. *The Independent*, No. 3535, Vol. 87, 1916, Sept. 4, pp. 333-335.

VAUGHAN, T. W. **Some littoral and sublittoral physiographic features of the Virgin and northern Leeward Islands and their bearing on the coral reef problem.** Map, diagrs. *Journ. Washington Acad. of Sci.*, Vol. 6, 1916, No. 3, pp. 53-66.

SOUTH AMERICA

GENERAL

BABSON, R. W. **The future of South America.** xi and 407 pp.; maps, ills., index. Little, Brown & Co., Boston, 1915. $2.00. 7½ x 5.

This book is of more value for the impressions it records than for the information it furnishes. The impressions of a trained economic observer of a continent in which there is so much interest are likely to prove readable even if based on a rather short tour of the main traveled routes.

The book has two underlying ideas, not always fully expressed, which are worth noting. One is most clearly stated in connection with the West Indies, though various passages indicate that this idea seems to Mr. Babson more or less applicable to all Latin America at present. Though specially optimistic about Santo Domingo, about the West Indies as a whole he says (p. 37): "Any reader of this book who has energy and ability enough to make a success in the West Indies can with the same ability make a greater success in the United States." The other idea crops out in numerous places, namely, the need of new blood in Latin America, though to a less degree in Argentina. This thought is epitomized toward the end of the book when the author says (p. 357): "The great need of all Latin America is for a strong and industrious middle class. Place five millions of farmers in these countries and the future of them all is assured. But until there is a stronger middle class, the governments will continue weak, the banks will remain poor, the lands undeveloped, the minerals untouched, the water powers unharnessed and the future of South America will differ little from the past."

To these two opinions it is hard to take exception. Much of the information supplied, however, is evidently compiled from the usual handbooks. Occasionally some original data are given, for example, when the per capita failures of Argentina and the United States are compared (p. 243) to the disfavor of the former, being $7.40 and $2.55 respectively.

More enthusiasm than accuracy is employed when it is stated about the East Coast (p. 2) that "every inch of it is fertile" or about the Amazon valley (p. 315) that "it is impossible for the human mind to conceive the wealth and money-making opportunities in the great Amazon basin"—to which is added—"*for those willing to pay the price*" (italics my own). Mr. Babson's ideas of international exchange as shown on pp. 6-9 are a bit hazy, though he is certainly right in those same pages in saying that the United States is not getting all the news about South America. He undoubtedly overestimates Peru's future in cotton (pp. 157-158) because of the demonstrated limitation of area of cultivation of that staple. He probably underestimates Bolivia. Few would place, as he does, Venezuela ahead of Colombia in promise. With his general estimates of Uruguay, Argentina, and Chile, most authorities would probably agree. The familiar remarks about the vast area and resources of Brazil are present. It is interesting to contrast the physical content of the British Isles and Europe with their importance in the world.

Hurried preparation probably accounts for some minor errors in fact and form.

SELDEN O. MARTIN.

FARABEE, W. C. **Some South American petroglyphs.** Ills. Extract from Holmes Anniversary Volume, pp. 88-95. [Smithsonian Inst.], Washington, D. C., 1916.

Contains an interesting discussion of observations on petroglyphs along some of the rivers and savannas in southern British Guiana and northern Brazil. Incised designs of people, animals, etc., have been cut in rock in both exposed and hidden localities, on boulders, the faces of rock cliffs, and even in the midst of cataracts. Their meaning is not known, though there has been a good deal of theorizing about them with too little regard for the facts. The author makes an appeal for exact photographic copies. "It is difficult to draw a faithful copy, however much time is expended. For an example, see the numerous publications of the Dighton rock 'inscriptions.' Many copies were made by well-trained, educated men, yet no one could possibly recognize the earlier

copies from the later ones, or the original from any of them. One author thought them Phenician in origin, another Scythian, and a third Scandinavian, and each copied to suit his own preconceived idea. One's imagination can easily supply the missing line and make a monkey of a man. The camera has a good memory and no imagination." He concludes: "The study of petroglyphs is important because they are examples of early practices and the only evidence we have of an extinct culture. Whatever their significance may be, they are interesting to us because they are the first efforts by primitive man toward artistic presentation and mark a step in his evolution."

CAPPEAU, I. M. **A voyage to South America and Buenos Aires, the city beautiful.** 134 pp.; ills. Sherman, French & Co., Boston, 1916. $1.20. 8 x 5. [A rambling account in diary form of the ordinary South American tour.]

KING, C. P. **North American interests in South America.** Ills. *The South American*, Vol. 4, 1916, No. 12, pp. 327 and 342-345.

REID, W. A. **South America's part in supplying world's wool.** Ills. *The South American*, Vol. 4, 1916, No. 11, p. 299.

TOWER, W. S. **The Andes as a factor in South American geography.** *Journ. of Geogr.*, Vol. 15, 1916-17, No. 1, pp. 1-8.

WILSON, OTTO. **South America as an export field.** 216 pp., bibliogr. *Bur. of Foreign and Domestic Commerce Special Agents Series No. 81.* Dept. of Commerce, Washington, D. C., 1914. [A survey of the continent as a whole is followed by sections dealing with the individual countries from the standpoint of their resources and entry into trade, especially with the United States.]

BRAZIL

CARVALHO, C. M. D. DE. **Météorologie du Brésil.** With a preface by W. N. Shaw. XIX and 528 pp.; maps, diagrs., ills., bibliogr. John Bale Sons & Danielsson, Ltd., London, 1917. 9½ x 6½.

Brazil is a country of tremendous possibilities. Although essentially a tropical land, and with heavy rainfall, high temperatures, and vast forests over its equatorial portion, most of it is an open country, of elevated rolling campos and scattered trees, and with an agricultural and grazing future of great promise. So large is Brazil, so varied are its products, so important is its future for us of the north, that any study of its climates—for it has many climates—is of interest to a large number of persons well outside of the ranks of meteorologists. This volume on the meteorology (perhaps better the *climatology*) of Brazil is clearly written, systematically arranged, remarkably complete, and interesting throughout. The author, professor in the Académie des Hautes-Etudes in Rio de Janeiro, recently residing in London where much of his work was done, has evidently written *con amore*. He has made a very careful study of the literature of his subject, and his numerous quotations, as well as his bibliography, are evidence of his thorough acquaintance with that literature. The effort has been to summarize, critically, what has been done, and thus at the same time to indicate what still remains to be done.

The subject-matter is logically arranged under three divisions. First, under general topics, the author takes up the larger climatic conditions of the southern hemisphere as a whole, the problems of colonization, acclimatization, and health, and gives an historical account of the meteorological organizations of Brazil. The second part is devoted to the distribution of the meteorological (climatic) elements. Here are discussed the influence of latitude, altitude, etc.; the régime of the winds; the distribution of rainfall and the rainfall types; and the climatic provinces. In the third part (somewhat over 300 pages) the climatography of Brazil is discussed. The climatic subdivisions here adopted are as follows: Super-humid: Amazonia; Semi-arid: northeastern Brazil; Semi-humid marine: east coast; Semi-humid elevated: the high plateaus; Semi-humid continental: central Brazil; Super-humid marine: south coast; Semi-humid in middle latitudes: Plain of Rio Grande; Semi-humid elevated: high southern plateaus. The book is so arranged, therefore, that the reader who wants only a general view may find what he seeks in the earlier portions, while anyone who needs detail may turn at once to the later pages. The charts and diagrams, while not very numerous or elaborately drawn, are sufficient. The publication of this volume gives us peculiar satisfaction. We cordially agree with Sir Napier Shaw, who contributes a foreword, in his estimate of the interest and importance of Brazilian climatology. And we feel sure that Professor de Carvalho's excellent piece of work will be welcomed by the large numbers of those who are seeking authentic scientific information about South America.

R. DEC. WARD.

AMARAL, BRAZ DO. **Memoria sobre as terras orientaes da antiga freguezia de S. João Baptista de Geremoabo.** Map. *Rev. Inst. Hist. e Geogr. Brasileiro,* Special Vol. Part I, pp. 951-988. Rio de Janeiro, 1915.

BONARDELLI, EUGENIO. **Vita intellettuale, sociale, religiosa degli Italiani nello Stato de S. Paolo.** Ills. *Italica Gens,* Vol. 6, 1915, No. 3-6, pp. 95-108. Turin.

—— **Brazil: General descriptive data prepared in September, 1914 (reprinted May, 1915).** 47 pp.; diagrs., ills. Pan American Union, Washington, D. C.

FERREIRA, J. R. **Boletim mensal de estatistica da Cidade de Belém.** Vol. 11, 1916, No. 6, pp. 1-49. Dir. Geral do Serviço Sanitario do Pará, Brazil.

GOTTSCHALK, A. L. M. **Coal and fuel oil in Brazil.** *Commerce Repts.,* 1916, No. 107, pp. 490-492. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Harbor improvements in Brazil: Those at Rio Grande do Sul rapidly nearing completion; Agricultural and industrial activities.** Ills. *Dun's Rev.: Internatl. Edit.,* Vol. 27, 1916, No. 4, pp. 55-57. New York.

LYRA, A. T. DE. **A colonização da Capitania do Rio Grande do Norte até á occupação hollandeza.** *Rev. Inst. Hist. e Geogr. Brasileiro,* Vol. 77, 1914, Part I, pp. 9-40. Rio de Janeiro.

RUCH, B. G. **Breves noções de physiographia brasilica (fragmentos).** *Rev. Inst. Hist. e Geogr. Brasileiro,* Vol. 76, 1913, Part I, pp. 101-146. Rio de Janeiro, 1915.

SOPER, R. H. **The geology of Parahyba and Rio Grande do Norte, Brazil.** Maps, diagrs., ills. *Proc. Amer. Philos. Soc.,* Vol. 55, 1916, No. 1, pp. 1-20. Philadelphia.

—— **Trindade, Ilha da: Posição geographica, extensão e topographia.** Map. *Rev. Maritima Brazileira,* Vol. 36, 1916, No. 5-6, pp. 349-365. Rio de Janeiro. [Historical and geographical sketch of the oceanic island of Trinidad lying 10° east of the Brazilian coast.]

—— ***Pernambuco, Mappa de estado de.*** 1:500,000. Ministerio da Viação e Obras Publicas, Rio de Janeiro, 1915.

—— ***Amazon River. Para to Iquitos.*** 1:1,400,000. In 3 sheets. *U. S. Hydrogr. Office Chart No. 1986.* Washington, D. C., July, 1916.

EUROPE

ITALY

ANFOSSI, GIOVANNI. **Sul regime dei corsi d'acqua nel bacino padano.** Maps, diagrs. *La Geogr.,* Vol. 4, 1916, No. 4-7, pp. 205-225. Novara. [On the regimen of the watercourses in the Po Basin.]

ANNONI, A. M. **Le nostre aspirazioni coloniali dopo la guerra.** *L'Esplorazione Commerc.,* Vol. 31, 1916, No. 8, pp. 281-289.

BORGIANI, GIUSEPPE. **I communi della provincia di Ancona che hanno cambiato denominazione.** *La Geogr.,* Vol. 4, 1916, No. 4-7, pp. 225-230. Novara.

—— **Condizioni del lavoro in Italia con speciale riguardo alla mano d'opera agricola.** *Boll. della Emigrazione,* Vol. 15, 1916, No. 4, pp. 5-41. R. Commissariato della Emigrazione, Rome.

CORRENTI, CESARE. **Le frontiere italiane: Il Trentino.** *La Geogr.,* Vol. 4, 1916, No. 4-7, pp. 186-193. Novara.

DE LUCCHI, GUIDO. **Trentino e Tirolo (Aprile, 1914).** 82 pp. *Direz. Gen. degli Affari Comm.* [*Pubbl.*] *No. 16,* Minist. degli Affari Esteri, Rome, 1915.

FABIANI, RAMIRO, AND GIUSEPPE STEFANINI. **Sopra la natura e la distribuzione delle rocce terziarie della Venezia.** 23 pp.; map. *Ufficio Idrografico Pubbl. No. 66.* R. Magistrato alle Acque, Venice, 1916.

GORTANI, MICHELE. **L'opera forestale di Stato in Italia e le sue direttive.** *Giornale di Geologia Pratica,* Vol. 14, 1916, No. 1-2, pp. 43-52.

HYDE, W. W. **Mount Etna.** Ills. *Bull. Geogr. Soc. of Philadelphia,* Vol. 14, 1916, No. 2, pp. 37-59.

LOTTI, B. **Il Monte Fumaiolo e le sue sorgenti.** Map, diagr., ills. *Boll. del R. Comitato Geol. d'Italia,* Vol. 45, 1915, No. 3-4, pp. 115-135.

MASSARA, ANTONIO. **Paesaggi e costumi della campagna novarese.** Ills. *Riv. Mensile del Touring Club Italiano*, Vol. 22, 1916, No. 7, pp. 379-384.

PERRET, F. A. **The lava eruption of Stromboli, summer-autumn, 1915.** Ills. *Amer. Journ. of Sci.*, No. 252, Vol. 42, 1916, pp. 443-463.

RIGGS, A. S. **Inexhaustible Italy.** Ills. *Natl. Geogr. Mag.*, Vol. 30, 1916, No. 4, pp. 273-368. [Good photographs, some of which are geographical.]

SEGALA, GIACOMO. **I boschi del Trentino.** Ills. *Riv. Mensile del Touring Club Italiano*, Vol. 22, 1916, No. 9, pp. 497-504.

TENNEY, FRANK. **Race mixture in the Roman Empire.** *Amer. Hist. Rev.*, Vol. 21, 1916, No. 4, pp. 689-708. [Epigraphy applied to a determination of the degree and progress of Orientalization among the populace of Rome.]

ZON, RAPHAEL. **The industrial future of Italy.** Reprinted from *Yale Review*, July, 1916, pp. 702-713. Yale Publishing Assoc., New Haven.

WORLD AS A WHOLE AND LARGER PARTS

HERBERTSON, A. J. **A handbook of geography. Vol. II: Asia, Australasia, Africa, and America.** xvi and 681 pp.; maps, diagrs., index. Thomas Nelson & Sons, London, [1913]. 4s. 6d. 7½ x 5.

Volume 1 of this work has already been reviewed (*Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, p. 222). This, the last book which we can ever welcome from the pens of Professor and Mrs. Herbertson, may stand as a monument of the breadth of vision and clearness of presentation which geographers have come to expect from them. The regional method of treatment could have no severer test, nor prove its virtue more conclusively, than in the 179 pages given to Asia. The four great physical divisions of the continent are subdivided into 35 regions, and many of these into subordinate districts. The relief, structure, and drainage of each is described with sufficient fullness for the general reader. Eleven vegetation regions are correlated with ten climatic regions. This forms the basis of a brief economic survey, the whole serving as an introduction to a detailed discussion of 15 political divisions, Asiatic Russia having been discussed in Volume 1. Australasia and the Pacific Islands, Africa and America are treated in the same systematic manner.

In the general description of North America the reviewer has noted a score of questionable statements, most of which are of the same order of importance as the mention of "Mt. Mitchell, or Black Dome" as two names for a single peak. A chapter of 40 pages on the United States, contributed by Prof. Richard E. Dodge, shows how much safer the best of geographers may be when writing of their own country. Throughout the book, formal description is enlivened by picturesque quotations from original sources. There are more than two hundred of the simple, black-and-white maps in the use of which Professor Herbertson had no rival.

The general reader will find in this handbook a concise and trustworthy exposition of the geography of the globe, as it is understood by scientific geographers, and the student may find in it a model for the organization of the geographic material.

CHARLES R. DRYER.

CORNISH, VAUGHAN. **The strategic geography of the British Empire.** *Scottish Geogr. Mag.*, Vol. 32, 1916, No. 4, pp. 161-173. [A paper by the same author on the same topic, published elsewhere, was abstracted in the July, 1916, *Review* (Vol. 1, pp. 66-67).]

HARDING, GEORGE. **Coaling-ports of the world.** Ills. *Harper's Mag.*, No. 793, Vol. 133, 1916, June, pp. 27-37.

MARSHALL, F. R. **Features of the sheep industries of United States, New Zealand, and Australia compared.** 35 pp.; diagr., ills. *U. S. Dept. of Agric. Bull. No. 313.* Washington, 1915.

PARKINSON, T. W. F. **A regional geography of America, Africa, and Australasia.** 318 pp.; maps, diagrs., index. Collins' Clear-Type Press, London and Glasgow, [1916]. 2s. 7 x 5.

SHERRILL, C. H. **Modernizing the Monroe Doctrine.** With an introduction by N. M. Butler. xiv and 203 pp. Houghton Mifflin Company, Boston and New York, 1916. $1.25. 8½ x 5½.

—— **Strategic centers of world trade, The.** Map, ills. *Dun's Rev.: Internatl. Edit.*, Vol. 27, 1916, No. 6, pp. 35-38.

WILSON, HARRY. **The integration of the [British] Empire.** Maps. *United Empire*, Vol. 7, N. S., 1916, No. 10, pp. 654-672.

YATE, A. C. **The war and the East.** *Scottish Geogr. Mag.*, Vol. 32, 1916, No. 4, pp. 187-192.

PHYSICAL GEOGRAPHY

GEOLOGY AND GEOMORPHOLOGY

VAN DYKE, J. C. **The mountain.** xvi and 234 pp.; ills. Charles Scribner's Sons, New York, 1916. $1.25. 7½ x 5.

This is one of a series of little books by the same author, entitled "Studies in Impressions and Appearances." In this volume the author has attempted to paint a word picture which shall convey to the reader something of the inspiration which he himself experienced in the presence of mountain scenery in many lands. Since the true grandeur of Nature's masterpieces cannot be seen with the outer eye alone, Van Dyke very properly touches his brush to the palette of the geologist and physiographer to gain necessary color for a background against which the picture will appeal more strongly to the reader's understanding.

For the purpose of effective contrast, the first chapter is a telling picture of the Great Plains, the approach to the mountains of our western country. Visions of the Big Horns and more distant glimpses of the main Rockies gradually lead the reader's attention from the foreground of the picture to its main motive. A discussion of mountain-making processes is then introduced, in the course of which the author, like those historians who always begin with Adam, goes back to the nebular and planetesimal hypotheses in order to get a good start. There follow descriptions of outlying hills and foothills, the forest zone of the mountain proper, the barren uplands where lakes and torrents are more clearly in view, the glaciers and snow peaks of the highest levels with their associated spines and needles, and finally the over-arching sky of ever-changing colors.

The picture is skillfully drawn, and while it contains no such effective passages as Mark Twain's beautiful description of the Alps seen from the Rigi-Kulm in "A Tramp Abroad," it is harmonious throughout and effectively imparts to the reader the author's enthusiastic love of the mountains. For the ordinary mountain climber the author entertains a fine scorn, and aptly remarks that this species usually possesses better legs than eyes. One also detects a certain quiet enjoyment on the author's part when he describes changes of view incident to scientific progress as "science reversing itself"; yet he draws liberally upon the sciences of geology and physiography throughout the book. Indeed, it is just here that his artist's brush becomes most unsteady. One may pardon his using a technical term like peneplane without explanation and apparently without understanding; but to attribute the spines and needles of Alpine ranges to vertically tilted strata, and to omit mention of glacial sculpture followed by normal weathering of jointed rock, the principal causes of the forms in question, is a defect of more serious proportions; and of such defects there exist not a few. Despite their existence the volume makes delightful and profitable reading for every lover of Nature, be he trained scientist or untrained layman. DOUGLAS W. JOHNSON.

BELOT, EMILE. **Le volcanisme expérimental.** Diagr., ill. *La Nature*, No. 2248, 1916, Oct. 28, pp. 285-287.

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